

# MONTHLY WEATHER REVIEW.

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## INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during September, 1884, based upon the reports from the regular and volunteer observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month, are also given, and their approximate paths shown on chart i.

September was unusually warm over a greater part of the country east of the Rocky mountains, while to the westward the month was remarkably cool.

There was a marked deficiency in the monthly precipitation in the states bordering on the Atlantic and eastern Gulf coasts and over the middle and southern slopes. In the lower portions of the Ohio and Missouri valleys, throughout the Mississippi valley, in southern Texas, and west of the Rocky mountains, the precipitation was excessive.

Severe drought prevailed in the states on the Atlantic and Gulf coasts during the month.

The approximate paths of the centres of sixteen atmospheric depressions occurring within the limits of the Signal Service stations and of thirteen occurring over the north Atlantic ocean are shown on chart i. One of the latter was a tropical hurricane; that described as number 8 apparently developed near the south Atlantic coast and pursued an abnormal course. The average number of depressions occurring within the limits of the Signal Service stations in September, during the last eleven years, is nine, or seven less than the number for September, 1884.

Extensive auroral displays occurred on the evenings of the 13th and 17th; that on the latter date was observed at numerous intervening stations from Nova Scotia to the north Pacific coast and southward to southern Indiana and central Kansas.

An earthquake occurred on the afternoon of the 19th. The area affected by the shock extended from northeastern Michigan to the Ohio river and from western Pennsylvania to Indiana, and probably to eastern Iowa, a few reports having been received from that state, although none were received from Illinois.

Destructive tornadoes occurred in Iowa, Dakota, Minnesota, and Wisconsin on the 9th; and in Pennsylvania on the 28th.

In the preparation of this REVIEW the following data, received up to October 20th, 1884, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-nine Signal Service stations and seventeen Canadian stations, as telegraphed to this office; one hundred and sixty-seven monthly journals; one hundred and sixty-one monthly means

from the former, and seventeen monthly means from the latter; two hundred and fifty-nine monthly registers from voluntary observers; forty-seven monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports, through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Alabama, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific railway company; trustworthy newspaper extracts; and special reports.

## ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The mean atmospheric pressure for September, 1884, determined from the tri-daily telegraphic reports of the Signal Service, is exhibited by the isobarometric lines on chart ii. This chart shows an area of barometric maxima, inclosed by the isobar of 30.1, over the middle and south Atlantic states, the greatest mean pressure, 30.14, being reported from Charlotte, and Kitty Hawk, North Carolina. The mean pressure is least over an area extending from Arizona and New Mexico north-eastward to British America; in this region, two areas, inclosed by the isobar of 29.85, are shown, one including portions of Arizona and New Mexico, and the other covering Manitoba and the northern portions of Dakota and Minnesota. Between these areas of barometric minima the pressure increases to 29.89 over southeastern Wyoming, southern Dakota, and western Nebraska. To the westward of this region the mean pressure increases gradually, being greatest on the north Pacific coast where the barometric means reach 30.0.

Compared with the mean pressure for the preceding month (August), an increase varying from .01 to .06 is shown at stations west of the Rocky mountains; an increase also occurs in all districts east of the Mississippi river, with the exception of the upper Mississippi valley, the western portion of the upper lake region, and the Canadian maritime provinces. The increase in the districts east of the Mississippi is greatest from New Jersey and eastern Pennsylvania southwestward to northern Georgia, where the departures range from .05 to .09. From the Rocky mountains eastward to the Mississippi the barometric means are lower than for August, the departures being greatest from Manitoba southward to the central part of the Missouri valley, where they range from .05 to .08.

The mean pressure for September, 1884, compared with the normal (see chart iv.), shows a slight excess on the California coast, in the Ohio valley and Tennessee, east Gulf states, and on the Atlantic coast south of New England. In all other districts the mean pressure is below the normal, the departures being greatest in the upper Missouri valley and extreme northwest, where they range from .10 to .16.

## BAROMETRIC RANGES.

The monthly barometric ranges were greatest in the lake region and least in the southern districts; the extreme monthly

ranges are: .28 at Key West, Florida, and 1.26 at Mackinaw City, Michigan.

In the several geographical districts the ranges varied as follows:

*New England.*—From .69 on the summit of Mount Washington, New Hampshire, to .84 at Portland, Maine.

*Middle Atlantic states.*—From .56 at Norfolk, Virginia, to .84 at Albany, New York.

*South Atlantic states.*—From .37 at Atlanta, Georgia, to .52 at Kitty Hawk, North Carolina.

*Florida peninsula.*—From .28 at Key West to .33 at Cedar Keys.

*East Gulf states.*—From .32 at New Orleans, Louisiana, to .38 at Montgomery, Alabama.

*West Gulf states.*—From .36 at Galveston, Texas, to .50 at Fort Smith, Arkansas.

*Rio Grande valley.*—From .34 at Brownsville, Texas, to .36 at Rio Grande City, Texas.

*Tennessee.*—From .37 at Knoxville, to .43 at Nashville.

*Ohio valley.*—From .48 at Louisville, Kentucky, to .66 at Pittsburg, Pennsylvania.

*Lower lake region.*—From .69 at Cleveland, Ohio, to .87 at Buffalo, New York.

*Upper lake region.*—From .89 at Duluth, Minnesota, and Port Huron, Michigan, to 1.26 at Mackinaw City, Michigan.

*Extreme northwest.*—From .77 at Fort Buford, Dakota, to .93 at Saint Vincent, Minnesota.

*Upper Mississippi valley.*—From .45 at Cairo, Illinois, to .93 at Des Moines, Iowa.

*Missouri valley.*—From .82 at Leavenworth, Kansas, to .89 at Huron, Dakota.

*Northern slope.*—From .52 at Fort Maginnis, Montana, to .76 at North Platte, Nebraska.

*Middle slope.*—From .49 on the summit of Pike's Peak, Colorado, to .70 at Denver, Colorado.

*Southern slope.*—From .38 at Fort Stockton, Texas, to .53 at Fort Concho, Texas.

*Southern plateau.*—From .34 at Fort Grant, Arizona, to .44 at Prescott, Arizona.

*Middle plateau.*—From .75 at Salt Lake City, Utah.

*Northern plateau.*—From .54 at Spokane Falls, Washington Territory, to .74 at Boise City, Idaho.

*North Pacific coast region.*—From .56 at Fort Canby, Washington Territory, to .62 at Olympia, Washington Territory.

*Middle Pacific coast region.*—From .42 at Cape Mendocino, California, to .55 at Sacramento, California.

*South Pacific coast region.*—From .38 at Los Angeles, California, to .41 at San Diego, California.

#### AREAS OF HIGH BAROMETER.

Eight areas of high barometer were formed during the month; of which four, numbers iii., iv., v., and vii., appeared in the Pacific coast region and marched steadily across the continent. Four, numbers i., iii., iv., and viii., moved to the Atlantic coast, and clung there with great tenacity, causing the hot and dry weather to continue in the Atlantic coast states. All of these high areas brought decided changes of weather and temperature in their progress, except when they settled on the Atlantic coast; and all increased the influence and strength of the low areas that passed over the lake region and down the Saint Lawrence valley.

I.—The 7 a. m. map of the 1st showed an area of high barometer resting over the middle Atlantic and northern part of the south Atlantic states, and over the Ohio valley and Tennessee; the pressure, however, of this area was slightly below the normal, as it was also in all other sections of the country. By midnight this area had moved eastward and had extended along the Atlantic coast, so that it embraced the southern part of the New England states. In the middle Atlantic states alone was the pressure slightly above the normal. The afternoon map of the 2d showed a considerable rise, and a pressure .10 above the normal at coast stations of the middle

Atlantic states; by the morning of the 3d the line of .10 above the normal had extended to include the northern part of the south Atlantic states. By midnight of the 4th the line of .10 above the normal ran from near Duluth to Savannah; all the region east of the Mississippi river, except the northern part of the New England states, being above the normal. During all this time the pressure was greatest in the southern part of the middle Atlantic states and in the Carolinas; and this general condition continued until midnight of the 5th, when the normal line commenced to contract, and the pressure remained but slightly above the normal in Virginia and North Carolina until midnight of the 11th, when this high area entirely disappeared. From the 1st until the 9th the influence of this high pressure was felt in the states on the Atlantic and Gulf coast, where the winds were generally east to south; they were light and variable in the Ohio valley and Tennessee; southerly in the upper Mississippi and Missouri valleys, and south to west in the lake region. And from the afternoon of the 2d until the morning of the 10th the temperature was above the normal in all districts east of the Rocky mountains; and in the states on the Atlantic coast there was an almost entire absence of rain. The exceptions to this period of dryness being very light local showers in New England and on the Georgia coast.

II.—This area appeared in the British Northwest Territory on the afternoon of the 5th, and extended southeastward until the afternoon of the 6th, when it rested in the Yellowstone valley, where the pressure was .10 above the normal, having risen .30 to .40 in the twenty-four hours; from here it moved northeastward to Manitoba on the 7th, thence it moved eastward and entirely disappeared on the afternoon of the 8th. The influence of this high area was felt in the sudden falling of the temperature in Dakota, Montana, Wyoming, Nebraska, and Colorado, where, on the afternoon of the 6th, a fall of from 10° to 30° was shown to have occurred in the twenty-four hours. Frost occurred in Montana on the morning of the 6th. On the afternoon of the 7th the temperature was shown to have fallen from 10° to 30° in the northern part of the upper lake region; and frosts were reported by the press on the morning of this day in northern Minnesota and Dakota. As this area passed eastward the temperature rose quickly west of it.

III.—This area appeared in the south Pacific coast region on the afternoon of the 7th, and extended northward and eastward until the afternoon after the 9th, when the pressure was .20 above the normal, and was highest over the middle Pacific coast region. The midnight map of the 9th, showed this area as a long loop extending from California northeasterly to Manitoba. The 7 a. m. map of the 10th, shows this area as having become contracted, with the highest pressure in the Yellowstone valley. By midnight of the 10th, it had expanded, and moved southeastward, and embraced the upper Mississippi and Missouri valleys, Kansas and Colorado, and the pressure was from .10 to .20 above the normal in all this region, having risen from .10 to .40 in the twenty-four hours, the latter rise occurring in the Missouri valley. This area then moved a little north of east until the morning of the 13th, having gradually expanded so as to cover the lake regions, the middle Atlantic and New England states, the Ohio valley and Tennessee. The highest pressure on this date was north of Lake Huron, the readings at the stations in the northern part of the lake region being as follows: Mackinaw City, 30.50; Alpena, 30.49; Saugeen, 30.49; Parry Sound, 30.50. During the next twenty-four hours this area moved eastward with increasing pressure, particularly in the middle Atlantic and New England states, the rise being from .10 to .20. On the morning of the 14th the pressure was from .20 to .40 above the normal north and east of a line drawn from Duluth to Saint Louis, thence to Augusta, Georgia, and from there to Kitty Hawk, North Carolina. At this time the temperature in New England, the lower lake region, and in the northern part of the middle Atlantic states was from 10° to 15° below the normal, and killing frost was reported from Alpena. The weather was generally cool and clear, with high northeasterly winds on



the Atlantic coast. On the morning of the 15th this area had moved southward, with diminished pressure, to eastern Virginia, where it was from 30.32 to 30.40. Still diminishing, it moved southward, was highest in the Carolinas until midnight of the 16th, and finally disappeared on the afternoon of the 17th. While it hovered on the middle Atlantic and Carolina coasts its influence was similar to that of high area i.

IV.—This area appeared in the north Pacific coast region on the morning of the 13th, and, by the morning of the 15th, had embraced the entire Pacific coast, with an increase of pressure of about .10; at midnight of the 15th this area had expanded and the barometer was .20 above the normal in the north Pacific region, and in the northern part of California and Nevada. The afternoon map of the 16th showed this high area hovering over the north Pacific region, as did also the midnight map of this date. But the morning map of the 17th indicated a decided tendency for the formation of a high area in the Missouri valley; this was accomplished, and the afternoon map of this date showed its formation, although, at the same time, the pressure continued high in the north Pacific region. This area took an easterly motion with increasing pressure, and on the afternoon of the 18th the pressure was highest at Cairo, (30.22) and was from .10 to .18 above the normal in the upper lake region, the upper Mississippi valley, and in the Ohio valley and Tennessee. During the next twenty-four hours this area extended eastward and settled upon the Atlantic coast, from Nova Scotia to South Carolina, with a pressure of from .10 to .20 above the normal. The last vestige of this area was on the morning of the 20th, when it was passing off the Nova Scotia coast. The formation of this high area was attended in the north Pacific coast region by light rains and, afterward, by fair weather. On the morning of the 17th abundant showers fell in the Ohio valley and Tennessee, with northerly winds and lower temperature. While resting on the Atlantic coast its influence was similar to that of high area ii.

V.—This area also made its appearance in the north Pacific coast region, but was not very definite until the afternoon of the 18th. By midnight it had moved eastward with increasing pressure, and was distinctly outlined in Montana. In the next twenty-four hours it had extended still further eastward, the highest pressure (30.32) being in the Missouri valley, which pressure was .20 to .30 above the normal. The next twenty-four hours, that is, the midnight of the 20th, found it over the lower lake region and the Ohio valley, with a pressure .10 to .20 above the normal. The next twenty-four hours found it, like its predecessors, resting on the Atlantic coast, and then over the Carolinas, where it remained until the morning of the 23d, with the highest pressure in the middle and south Atlantic states, bringing again the hot, dry winds from the south, that seemed by this time to have burned everything from Georgia to Maine. On the morning of the 19th light frosts were reported from the Canadian stations on the lower lakes.

VI.—This area appeared in Manitoba on the afternoon of the 21st. It had a general eastward movement, with a slight inclination towards the lake region, until the morning of the 24th, when it rested over Nova Scotia, where the highest pressure was 30.29 to 30.33, being .20 to .30 above the normal. The progress of this area was preceded and accompanied by grateful showers in the lake regions, in New England, and the northern part of the middle Atlantic states. The morning after the 25th showed that it had disappeared. Killing frost occurred at Mackinaw City on the morning of the 22d; otherwise there were no decided changes of temperature, which, during the eastward progress of this area, remained near the normal, the greatest departure being 10° below.

VII.—This appeared on the morning of the 22d in the north Pacific region, where it remained nearly stationary until the morning of the 25th. The morning of the 26th showed a filling up with a tendency to move eastward, but this was checked, and a retrogression seemed to occur, and it hovered on the Pacific coast until midnight of the 29th, with diminishing pressure, when it appeared over Montana with a

pressure of 29.92 in the Yellowstone valley. The afternoon of the 30th showed that it had moved eastward over Minnesota where the pressure was 30.10, which was .10 to .15 above the normal. The midnight map of the 30th showed an extension to the south and eastward, with the highest pressure over Lake Superior from .20 to .27 above the normal. Killing frosts occurred in Montana on the morning of the 29th and 30th, and in Dakota on the latter date; and on this day the temperature was generally 10° to 20° below the normal in Montana, Dakota and Wyoming.

VIII.—This area appeared to form suddenly about midnight of the 23d in Colorado and Kansas; there was a rise of .10 to .20 in eight hours; it seems to have been a part of vii. when this area retreated. By the afternoon of the 24th area viii. had moved eastward, the highest pressure being observed in Kansas, where in the twenty-four hours there was a rise of .40. The morning of the 25th showed a general extension and movement eastward, the highest pressure, 30.21, being in Illinois. At midnight of this date the pressure was highest over the lower lakes (from 30.30 to 30.34), with a general increase in the Mississippi valley and all the region eastward, where it was from .10 to .20 above the normal. The weather was generally clear, and the temperature very nearly normal. In the next twenty-four hours it moved eastward, with increasing pressure (30.40 to 30.43) over Nova Scotia, being .20 to .35 above the normal in New England, the middle Atlantic states, and in Nova Scotia. From this time until midnight of the 30th the pressure gradually decreased, but remained nearly stationary on the Carolina coast, where this area clung tenaciously, producing effects similar to all the rest that remained here for any length of time, and causing the temperature to continue somewhat above the normal in the middle, south Atlantic and Gulf states, and in the Ohio valley and Tennessee.

#### AREAS OF LOW BAROMETER.

There were sixteen well-defined areas within the limits of the stations of the Signal Service during the month, eight of which developed between the 98th and 114th degrees of west longitude and the 37th and 42d degrees of north latitude. These moved northeastward to the upper lake region and, all but one, thence down the Saint Lawrence valley. Only one storm, low area vii., presented tropical characteristics, but the data do not warrant any tracing of its track before the morning of the 10th; it remained nearly stationary on the Georgia and South Carolina coast. The remaining seven originated in the extreme northwest and in the British Northwest Territory. With two exceptions, areas vii. and xii., they moved eastward into the lake region and thence down the Saint Lawrence valley. Nearly all these storms exhibited considerable energy.

The following table shows the latitude and longitude in which the centres of the several areas were first and last located, and the average hourly velocity of movement:

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.....	50 15	66 00	48 30	57 00	29.7
II.....	49 30	102 00	50 00	55 00	29.2
III.....	41 00	114 00	50 00	95 00	35.0
IV.....	38 30	104 30	51 30	61 15	40.6
V.....	39 30	113 00	46 30	61 30	46.0
VI.....	38 15	104 00	50 30	58 00	32.5
VII.....	30 45	81 00	31 45	79 00	8.2
VIII.....	40 00	113 00	38 30	103 30	15.0
IX.....	47 30	100 00	51 00	61 00	29.7
X.....	45 30	96 30	49 00	57 00	31.6
XI.....	47 30	103 30	51 00	65 00	38.5
XII.....	52 00	102 00	51 00	60 00	37.5
XIII.....	41 30	98 30	51 00	60 00	35.3
XIV.....	38 30	105 30	51 00	65 30	35.0
XV.....	51 00	106 30	49 30	61 30	39.3
XVI.....	39 30	107 30	49 00	74 00	38.5
Mean hourly velocity.....					32.6

\* Centres united in N. 43° 00', W. 96° 00'.

I.—This depression was fully described as number xi. for August, and by midnight of September 1st had passed over the Gulf of Saint Lawrence to Newfoundland; from this point it probably merged with that charted as number 1, of the north Atlantic storms.

II.—This area was first noticed on the morning of the 1st in Manitoba, where in the previous twenty-four hours there was a fall of .50, with the same depression below the normal. This area remained nearly stationary in Manitoba until the afternoon of the 2d, when it seemed to take a course a little to the west of north, and rains were reported in northern Dakota and Montana and in Manitoba, and the territory to the west, with brisk northwest to southwest winds. The centre seemed to linger in the vicinity of Lake Winnipeg until midnight of the 3d, when it took up a decided movement eastward. Light local rains occurred in the northern part of the upper lakes, and the winds were quite fresh. By midnight of the 4th the centre was north of Father Point, with high wind and threatening weather at that place. On the afternoon of the 5th it had reached the coast of Newfoundland; the winds were fresh, but the rainfall was local and light. In the movement eastward the pressure steadily increased, but was .20 to .26 below the normal when last noted. From this point it will be described as number 4, of the north Atlantic storms.

III.—This area was first apparent on the afternoon of the 4th, and the centre was just west of Salt Lake City, the pressure being .30 below the normal, a fall of .30 in the twenty-four hours. By the morning of the 5th it had moved in a northeasterly direction to the western part of Dakota; on the north and east sides of the centre there were abundant rains. By midnight of the 5th the centre was in the eastern part of Manitoba, with rains to the west and southwest of the centre. The 7 a. m. map of the 6th showed that this depression had filled up and lost its strength, or had combined with area iv.

IV.—This area formed in Colorado on the afternoon of the 5th, and by the morning of the 6th extended in a long trough from Colorado to the western end of Lake Superior; the barometer was from .12 to .24 below the normal. The centre of the depression was in the southwest corner of Minnesota. In the afternoon the centre was north of Lake Superior. Light rains were reported in the upper Mississippi and Missouri valleys. By the morning of the 7th the centre was north of Lake Huron and nearly west of Ottawa; rains fell in the upper lake regions and in the upper Mississippi and Missouri valleys. On the afternoon of the 7th the centre was north of Ottawa, with the pressure at that place .16 below the normal. By the morning of the 8th the centre had reached the Labrador coast, and in its progress had been accompanied by light rains in the lower lake region and in the province of Ontario; light rains also fell in New England. From this point it will be described as number 5, of the north Atlantic storms.

V.—This area formed in Utah on the morning of the 7th. At Salt Lake City the pressure was .30 below the normal. In the next twenty-four hours the centre had moved northeastward and was between Huron and Bismarck, Dakota. Light rains fell in western Minnesota, in Dakota, Montana, and Manitoba. From this point the centre moved nearly northward, and at midnight of the 8th was near the northern end of Lake Winnipeg. Abundant rains fell in Minnesota and in the northern part of the upper lake region; in the two last mentioned sections the winds were fresh, whilst in Manitoba the storm was severe. By midnight of the 9th the centre had gone northward and then turned suddenly eastward, and on the morning of the 10th was in the southern part of the Gulf of Saint Lawrence, from which point it passed eastward, with increasing pressure, off the coast.

VI.—This area developed in southeastern Colorado on the 8th; at midnight the pressure at West Las Animas was .28 below the normal. By midnight of the 9th, the centre had moved to the vicinity of Omaha, with considerable rain in Minnesota, Dakota, and eastern Montana. By the afternoon of the 10th, the storm was central over Lake Superior, with

rain and fresh winds. On the morning of the 11th, the centre had moved eastward, and was near Ottawa. The rain area had extended, and had included the southern part of the upper lake region, and the lower lake region. Rains also fell in Illinois. By the morning of the 12th, the centre had moved in a northeasterly direction, and was on the western coast of Newfoundland, with the pressure .30 to .40 below the normal in the Gulf of Saint Lawrence. Fresh and occasional high winds and rain accompanied the movement of the centre, and the storm was severe in the Gulf of Saint Lawrence. From this point this area will be described as number 9, of the north Atlantic storms.

VII.—This was the only storm that reached the coast during the month which presented features of a tropical character, but the data do not warrant any tracing of its track before the 10th, on the morning of which date it appeared off the Georgia coast, the barometer at Savannah showing a fall of .11 in eight hours, with a fresh easterly wind, and rains at Charleston, Savannah, and Jacksonville. On the morning of the 20th the centre was between the two last named cities. In the next twenty-four hours it had moved inland and was between Savannah and Augusta, with rain at both places, and a fresh southerly wind at the former and a northerly wind at the latter. In the next eight hours it moved northward and was between Charleston and Augusta, with fresh winds at both places. At midnight of the 11th and on the morning of the 12th, the centre remained nearly north of Charleston, and the pressure was about .20 to .23 below the normal, being at Charleston, 29.84. Heavy rains fell at Charlotte and at Fort Macon, North Carolina, and at the latter the wind reached a maximum velocity of 32 miles. On the afternoon map of the 12th it appeared that the centre was near the coast between Charleston and Savannah. Heavy rains fell at these two places, and a very heavy rain at Fort Macon—3.20 inches in eight hours. The barometer at Charleston was 29.78, being .25 below the normal. High winds occurred at Fort Macon and Wilmington, the maximum velocity at each being 32 miles. The midnight map of the 12th showed the centre to be southeast of Savannah; northward from here the rain was general on the coast to Hatteras, the rainfall at Charleston being 3.43 in eight hours. The morning of the 13th the centre was east of Savannah, and rain fell on the coast from Hatteras to Jacksonville. From here the storm-centre seemed to move in an easterly, then it took a northerly direction, as high winds occurred on the coast as far north as Block Island until the morning of the 14th. The following maximum velocities were reported at this time: Sandy Hook, 33; Delaware Breakwater, 58; Chincoteague, 31; Cape Henry, 41; Kitty Hawk, 47; Fort Macon, 40. At midnight of the 13th the following velocities were reported: Block Island, 32; Sandy Hook, 39; Chincoteague, 44; Delaware Breakwater, 44; Cape Henry, 39; Kitty Hawk, 50; Hatteras, 32; Fort Macon, 42. At Kitty Hawk the storm signal was ordered and displayed sixty-one hours before the storm came, and was fully justified with the above velocity: the storm continued for sixty hours. From the morning of the 13th this storm will be referred to as number 8 of the north Atlantic storms.

VIII.—This area appeared in Utah on the morning map of the 13th, with a pressure, at Salt Lake City, of 29.76, which was .15 below the normal, and in the afternoon it was .21 below the normal. In the next twenty-four hours the centre had moved eastward and was between Denver and West Las Animas, with a pressure .19 below the normal at the latter place. On the 14th rain fell at Salt Lake City, and heavy rain in front of the storm at Omaha, at the latter place 1.26 inches. At midnight the centre was east of Denver, but the morning map of the 15th showed this area to have disappeared as a distinct storm, apparently having combined with the next storm which was more severe and was further north.

IX.—This depression developed on the afternoon of the 14th east of Bismarck, where the barometer was 29.79, being .16 below the normal. The wind was northwest and fresh, and rain was



falling. The wind at Moorhead at this report was 29 miles. By midnight the centre had moved northward into Manitoba, where rain fell, as also in Dakota, Minnesota, and Montana. The morning map of the 15th showed a trough extending to Colorado, but the centre of the storm was in northern Minnesota, and this area seems to have drawn into it low area viii. The rains continued in Montana, Dakota, Minnesota, and extended into Wisconsin. By midnight of the 15th the centre was north of Lake Superior, with the pressure over the upper lakes from .10 to .52 below the normal, the latter figure being reached at Marquette. Rains were general in the northern part of the upper Mississippi valley and the northwest part of the upper lakes. With the eastward movement of the centre clearing and fair weather prevailed in Dakota and Montana. On the morning of the 16th the centre was northwest of Ottawa, and the winds were fresh, and at several places high, in the lake regions. Local rains fell in the upper Mississippi valley, upper lake region, and in the Saint Lawrence valley. On the morning of the 17th the centre was on the coast of Labrador, and in the twenty-four hours preceding rain fell in New Brunswick, Nova Scotia, and northern part of New England. From this point this area will be number 10 of the north Atlantic storms.

X.—This area developed on the afternoon of the 18th, the map showing a fall of .10 in eight hours at Moorhead; the midnight map showed the centre to be nearly south of that place, with the pressure .10 below the normal. On the morning of the 19th the centre had moved to the northern shore of Lake Superior; by the afternoon it had moved to the northeastern shore of the lake, with increasing fresh winds and local rains in the upper lake region. By the morning of the 20th the centre was a little northwest of Montreal and east of Ottawa; the pressure was about .10 to .14 below the normal. The rain was light but almost general in the lower lake region and in the province of Ontario. In the afternoon of this day the centre was between Quebec and Montreal, with rain at the latter place and in northern New York. High winds occurred on Lake Ontario. At midnight the centre had moved to the mouth of the Saint Lawrence; the rainfall was general in New England and in the province of Quebec, although light. Sleet occurred on Mount Washington. By the afternoon of the 21st the centre was in Newfoundland. Light rains fell in Nova Scotia and New Brunswick.

XI.—This area appeared in the northwest part of Manitoba on the afternoon of the 20th. In eastern Dakota the barometer showed a fall of .20 in eight hours. On the afternoon of the 21st the centre was north of Lake Superior; the winds were high at Marquette, Escanaba, and Mackinaw, and the pressure at these places about .20 below the normal; at Mackinaw City the barometer had fallen .28 in eight hours. No rain had thus far accompanied the movement. At midnight, however, with the combination of high area number vi., local rains fell in the upper Mississippi valley, and northern part of the upper lake region. On the morning of the 22d the centre was near the mouth of the Saint Lawrence river, and its movement was accompanied by light local rains in the provinces of Ontario and Quebec. By midnight the centre had moved northeastward into Labrador, with clear weather and higher barometer in the Saint Lawrence valley.

XII.—This area appeared on the afternoon of the 22d in the northwestern part of Manitoba, and moved in a southeasterly direction until midnight of the 23d when it united with area xiii. in the southern part of Wisconsin. It was accompanied by light rains in Minnesota and Wisconsin on the 23d.

XIII.—This area formed on the morning of the 23d in eastern Nebraska near Omaha and Yankton; the pressure was .37 and .39 below the normal at these places, respectively. Its formation was attended by general rains in the upper Mississippi and Missouri valleys and in the southern part of the upper lake region. On the afternoon of the 23d the centre was between Yankton and Omaha; at the latter place the pressure was .48 below the normal. By midnight it had moved east-

ward to the southern part of Wisconsin, where it united with area xii. At this time the rain area extended as far east as eastern New York and was a long narrow oval, taking in the lake region and extending to the Indian Territory. The minor axis of this oval was from Huron, Dakota, to Saint Louis, Missouri, and the major axis from near Quebec to Fort Sill. By the morning of the 24th the centre had moved northeastward and was near Escanaba, with a high wind and heavy rain at this place—.227 inches. The rain area had moved eastward and had preserved nearly the same form; the major axis extended from Quebec to Fort Sill and the minor axis from Saint Paul to Louisville. The winds were fresh and high on the lakes. Near the storm-centre the pressure was .60 to .75 below the normal. The fall in the barometer was .60 in the twenty-four hours, and .30 in the eight hours preceding. The storm continued in the lake region on the afternoon of the 24th with the centre near Ottawa. High winds and local rains occurred in these regions, and rain fell also in the Ohio valley. Colder clear weather followed in the western part of the upper lake region and in the upper Mississippi and Missouri valleys. On the morning of the 25th the centre was near the mouth of the Saint Lawrence river, and in the preceding sixteen hours rain had fallen in northern New England, and in the Saint Lawrence valley, and eastern part of the lower lake region. From there the storm passed off the Labrador coast, and will be described as number 12 of the north Atlantic storms.

XIV.—This area appeared in Colorado on the afternoon of the 25th, with the centre south of Denver, and west of West Las Animas, where the barometer was 29.69, or .21 below the normal. On the morning of the 26th, the centre was east of Denver and north of West Las Animas. In the afternoon, the centre was southeast of North Platte. The weather was cloudy in the upper Mississippi and Missouri valleys. Rain fell in the west Gulf states, and in the Ohio valley and Tennessee, and in Illinois. By midnight, the storm centre had moved to the central part of northern Iowa, with the pressure from .20 to .25 below the normal. Thunder storms occurred at Saint Paul, and at La Crosse, and the rainfall was nearly general in the Mississippi and Ohio valleys. The following heavy rains occurred: Omaha, 1.22; Saint Louis, 1.44; Springfield, 1.84, in eight hours. On the morning of the 27th, the storm was central over the eastern end of Lake Superior. The winds were generally fresh, and the rain area covered the lake regions, the Ohio and upper Mississippi valleys and the west Gulf states. The following heavy rains occurred: Chicago, 1.09; Alpena, 1.06, La Crosse, 1.48; Des Moines, 1.42, in eight hours. On the afternoon of the 27th, the centre was over Georgian bay, and the rain area had extended down the Saint Lawrence river beyond Quebec. High winds were recorded at all stations on the lower lakes. Rain continued in the Ohio valley, and in the west Gulf states; at Galveston, 1.78 inches fell in the eight hours preceding; and 1.33 at Brownsville; 1.42 at Louisville, and a thunder storm at Cairo. On the morning of the 28th, the centre was a little northwest of Anticosti. The rain area extended from Leavenworth to Sidney, and abundant rains fell on the Texas coast; at Galveston, 1.21, and at Indianola, 2.07. The pressure was below the normal in all districts except the north Pacific coast region, and the south Atlantic states, and eastern part of the east Gulf states; north of the fortieth degree of latitude, and east of the one hundred and twelfth degree of longitude, it was from .10 to .40 below the normal. From this point the storm passed beyond the limits of the stations of observation.

XV.—This depression appeared in the British Northwest Territory, north of Montana, on the morning of the 27th. In Montana the barometer fell .20 in eight hours, and was from .30 to .45 below the normal. By midnight of the 27th the centre had moved eastward to the northern part of Manitoba, where the pressure was .60 below the normal. This depression seemed to reinforce the rainfall following area xiv. in the upper lakes and upper Mississippi valley. By the afternoon of the 28th the centre had extended suddenly east-southeastward

and was north of Lake Huron, with a fall in the barometer of .22 in eight hours at Alpena, .26 at Saugeen, .25 at Rockliffe, which was .40 to .50 below the normal. A very heavy rain of 2.32 inches occurred at Alpena and 2.31 at Escanaba. The winds were fresh and high on the lakes, and continued until the morning in the eastern part of the lower lakes. On the morning of the 29th the centre was northwest of Father Point, with rains in New England and the northern part of the middle Atlantic states and in Nova Scotia. In the afternoon the centre was east of Anticosti, and from here passed over Newfoundland, whence it will be described as number 13 of the north Atlantic storms.

XVI.—This area developed in western Colorado about midnight of the 28th, with a pressure .20 to .30 below the normal. By the afternoon of the 29th the centre had moved northeastward and was near Yankton, with the pressure .41 below the normal. At midnight it was a severe storm in Minnesota, with the centre near Saint Paul, where the weather was threatening and the wind had a velocity of 27 miles. On the morning of the 30th the centre was over Lake Superior. Rain fell in Minnesota and the northwest part of the upper lakes, in the Ohio valley and in the lower lake region. A thunder storm occurred at Davenport, Iowa. In the afternoon of the 30th the centre was north of Lake Huron, and the rain continued in the lower lake region and in the southern part of the upper Mississippi valley. The winds on the lakes were not very strong. At midnight the centre was northwest of Quebec, with partly cloudy weather and local rains in the Saint Lawrence valley and in the lower lake region. The only high wind attending this storm was at Duluth, 41 miles, the morning of the 30th. At the midnight report cooler, clearing weather followed in the upper lake region, and clear weather in the northwest.

#### NORTH ATLANTIC STORMS DURING SEPTEMBER, 1884.

[Pressure expressed in inches and in millimetres; wind-force by scale of 0—10]

The paths of the atmospheric depressions that have appeared in the north Atlantic ocean during the month have been approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels; from data obtained through the co-operation of the Hydrographic Office, U. S. Navy, and the "New York Herald Weather Service;" also from abstracts of the logs of Spanish steamers, furnished through the courtesy of the Reverend Benito Viñes, S. J., Director of Belen College Observatory, Havana; and from other miscellaneous data received at this office up to October 25, 1884.

To the Hydrographic Office, U. S. Navy, the Chief Signal Officer desires particularly to express his indebtedness for valuable information and data furnished through the kindness and courtesy of the officers there on duty.

The Chief Signal Officer calls the attention of co-operating observers to the importance of carefully noting each successive change of wind, especially when in the vicinity of tropical hurricanes, and, when practicable, the hour at which such change occurs; also the vessel's course and rate of sailing per hour, or her estimated drift when hove to.

The most noteworthy feature of the month of September was the occurrence of two tropical hurricanes during the first half of the month. The first of these originated to the eastward of the forty-fifth meridian and near N. 15°, moving thence west-northwestward to about W. 57°, where it recurved to the northeastward. The second hurricane appears to have developed near the coasts of Florida and Georgia, no observations having been received which point to its existence at a lower latitude, or prior to the 10th; the centre of this hurricane remained near the coast of the United States for three or four days, during which the disturbance exhibited great energy and finally moved northeastward along the course of the Gulf stream. The month was unusually stormy over the region south of N. 40° and between W. 20° and 40°. Several depressions passed northeastward at latitudes north of 50°, such

being, in general, continuations of disturbances which originated in the United States. The weather, during September, over that part of Atlantic between the United States and Europe, most frequented by steamers, may be summarized as follows: 1st to 20th, strong breezes to gales from sw. to nw.; weather generally cloudy or rainy, frequent fogs west of the fiftieth meridian. From the 20th to 30th, moderate to strong gales, especially heavy over the region east of W. 40°, weather cloudy or rainy.

The following are descriptions of the storms charted:

1.—This disturbance appeared near N. 41°, W. 58°, on the 1st, and caused strong se. gales over the ocean south of Newfoundland. Captain Braes, commanding the s. s. "State of Nebraska," in N. 42° 30', W. 61° 45' reported as follows: "4 a. m., barometer 28.81 (756.9), wind se., force 5, hauling to eastward; ran into what was evidently the northern edge of a cyclone moving to the eastward, barometer (aneroid) falling .4 inch in two hours; very high sea from sw. At 6 a. m., barometer 29.4 (746.7), oscillating .2 inch, wind nne., force 9, very heavy rain; 9 a. m., barometer 29.6 (751.8) rising, wind nw., weather clearing; noon, barometer 29.9 (759.4), light wind, fine weather." The s. s. "Oder," in N. 43° 55', W. 58° 01', had a fresh sse. gale from 10 a. m. to 3 p. m., then from se. to sw., blowing with hurricane force, with heavy rain. The bark "Addie E. Sleeper," lost spars and sails during a heavy gale in N. 41° W 61°, and the bark "Engelbert," sixty miles east of Sable island, lost sails in a hurricane on the 1st; several vessels on the Banks had severe gales, and sustained loss of spars and sails. On the 2d, the centre of disturbance was to the northward of the fiftieth parallel, the minimum barometric reading being 29.36 (745.7); moderate to strong sw. breezes prevailed over the Banks, with s. and e. winds, north of 53° N., and east of 45° W. During the 3d, 4th, and 5th, the disturbance moved eastward north of the fifty-fifth parallel, the pressure ranging from 29.2 (741.7) to 29.6 (751.8). On the 6th, the area of low pressure was to the northward of the British Isles.

2.—This was a tropical hurricane which prevailed over the Atlantic south of the thirtieth parallel during the first decade of the month, having developed within the region south of 15° north latitude, and east of 47° west longitude. The earliest reports relating thereto, as yet received, date from the 3d of the month and are as follows: On the 3d Captain N. C. Walker, commanding the bark "Campanero," in about N. 13° 27', W. 47° 33', reported: "wild, threatening weather throughout the day; at 9 p. m. the wind was nnw.; at 10 p. m. nw. by w.; 11 p. m., nnw.; at 1 a. m. of the 4th it was w.; 2 a. m.; sw.; 3 a. m., s.; barometer 29.84 (757.9). The wind blew in heavy heavy and sudden squalls of about two minutes duration, with heavy rain and high seas; at 8 a. m. the barometer began to rise, but the squalls of wind and rain continued and a very rough and confused sea came up from s. and sw.; at noon the wind was blowing a strong breeze from ssw., with rain, and the sea became more regular."

On the 4th the bark "Ella," from Buenos Ayres to Boston, in N. 16° (no longitude given), had a heavy gale from w., in which she lost and split sails; and the brig "Emeline," on the same date, in N. 16° 23', W. 52° 24', had a heavy gale from nne. to ssw., lasting twelve hours. On the 5th Captain H. F. Schive, commanding the brig "Lilian," in about N. 17° 39', W. 57° 50', reported very heavy ene. and ese. sea swell, with cloudy, squally, and threatening weather and strong nw. wind until 2 p. m., when it began to blow in heavy squalls, with rain, from w. and w. by s.; barometer 29.79 (756.7). This weather continued for about six hours, when the wind shifted to sw. and blew with the force of a moderate gale.

The above vessels appear to have been to the southward of the storm-vortex, which was evidently moving in a westerly or west-northwesterly direction, as shown by the directions and shifts of the wind; it appears probable that they were, however, at a considerable distance from the vortex, since the wind with them did not exceed the force of a moderate to



fresh gale. On the 6th the brig "Comalo" encountered a hurricane in N. 18° 58', W. 58° 0', and put into Saint Thomas, September 23d, leaky and partly dismantled; the direction of the winds and observations have not been received from this vessel, but the damage she sustained shows that she was probably at no great distance from the storm-centre. The report of the s. s. "Plato," H. W. James commanding, indicates the position of the vortex on the 7th; the following is an extract of the log of that vessel:

Encountered a cyclone in lat. 22° N., long. 57° W., September 7, 1884.

September 5, 8 a. m., barometer 29.83 (757.7), wind sw. by s., fresh gale, heavy rain and high sea, vessel laboring and straining and shipping heavy seas over all. 12 m., wind ssw., barometer 29.82 (757.4), wind increased to a strong gale and gloomy weather and high sea. 4 p. m., wind south, barometer 29.81 (757.2), strong gale, continued same until 8 a. m., September 6, when wind shifted to se. by s., barometer 29.71 (754.6), strong gale, hard squalls and heavy rain. Hove to on starboard tack. 12 m., wind sse., barometer 29.76 (755.9), blowing furiously. 2 p. m., wind s. by e., barometer 29.72 (754.9), fresh gale, very hard squalls. 8 p. m., wind south, barometer 29.68 (753.9), increasing gale, very hard squalls. 12 midnight, wind s. by e., barometer 29.38 (746.2), strong gale. 4 a. m., September 7, wind sse., barometer 28.90 (734.0), strong gale, rain and mountainous sea. 8 a. m., wind se. by s., barometer 28.40 (721.3), blowing a hurricane, air thick with rain, and high sea, which swept over vessel. 9 a. m., wind se. by s., barometer 28.26 (717.8), broached to on port tack. 10 a. m., wind suddenly lulled and veered to wnw., again blowing a hurricane, ship settled to starboard, gunwale in water. The wind then decreased gradually and barometer rose gradually.

The above shows that the hurricane had recurved and was then moving in a north-northeasterly direction. Through the courtesy of the Rev. Benito Viñes, S. J., director of the Belen College Observatory, Havana, reports have been received from two vessels which were in the eastern quadrants of this cyclone. The s. s. "Ciudad de Santander," D. F. Cimiceno, commanding, reported: "7th-8th, the day began with threatening weather, fresh se. wind, heavy sea swell from sw. and w., and gradually falling barometer; 9 p. m., fresh se. wind, high, confused sea from sw. and w., heavy rain and violent squalls. The sky and horizon assumed a grayish color, and the sea became so furious as to prevent all headway; hove-to on the port tack until 12 hours, when it was blowing a strong se. gale, barometer falling until 15 hours, when there was a sudden fall from 29.88 (759.0) to 29.49 (749.0), with furious sea from se., s., sw. and w., threatening appearance and heavy rain."

"Judging that the centre of cyclone bore approximately sw. from the vessel, run ship to the northeastward in order to reach the manageable semicircle of the cyclone; barometer stationary at 29.49 (749.0); estimated position, latitude 25° 42' N., longitude 52° 52' west of Greenwich."

"Sept. 8-9th.—Strong se. gale, high sea from se., s., sw., and w., threatening weather, rain squalls and violent gusts of wind; at 10 p. m. wind hauled to sse. and blew with great force; very high sea; rain; barometer stationary at 29.49 (749.0). At 15 hours, put ship on the starboard tack; at daylight the wind hauled to s., no change in barometer; at 20 hours the barometer began to rise; at noon, estimated position, lat. 27° 45' N., long. 51° 03' W. of Greenwich, barometer 29.76 (756.0), rising. 9-10th: fresh s. winds, barometer 30.0 (762.0) weather cloudy, small rain, sea less violent and weather improving; at 12 hours laid on our course, full speed ahead, sky clearing."

The s. s. "Antonio Lopez," Dominguez, commanding, on the 6th had fresh s. to se. wind and rainy weather; at noon strong e. wind, high sea from s. and sw., barometer falling; position about N. 25°, W. 51° (longitude supposed w. of Greenwich). During the 7th the wind became stronger and was accompanied by heavy rain; at night it increased to a hurricane from e. and ene., with violent squalls and high sea from e., s., and sw.; at 20 hrs. the barometer rose slightly; at 22 hrs. the wind hauled to nne., and the barometer again fell; at 24 hrs. hard squalls from n., barometer rising. On the 8th sky clearing and barometer rising.

The vessel's position on the 7th is not given, but from the above report it would appear that she crossed the path of the cyclone and was to the northeastward of the vortex.

On the 8th, the bark "Norden," in N. 25°, W. 52°, had a hurricane, lasting from noon of that day until 6 p. m. of the 9th, in which she lost rigging, etc.

On the 11th the storm-centre moved in an easterly direction, passing to the southward of the bark "Superbo," which reported, as follows: 10th, in N. 28° 00', W. 52° 45', in the evening, sky obscured, fresh ssw. wind, heavy sea from same direction, barometer falling gradually; at night, wind increasing, with heavy squalls and high sea. On the 11th, at 4 a. m., the wind hauled from ssw. to s., with falling barometer; at 10 a. m., the wind hauled to e., barometer rising and weather improving; the wind afterwards hauled to ne.; position at noon of the 11th, N. 29° 10', W. 54° 10'.

The data received at this office up to the present are not sufficient to show the track of this cyclone after the 11th; it is probable, however, that the disturbance traced as number 7 was closely connected with it, since hurricane winds and stormy weather prevailed near N. 30°, and between W. 50° and 55°, from the 11th to the 14th.

3.—This disturbance appeared on the 5th, near N. 50°, W. 29°. The s. s. "Zeeland," A. J. Griffin commanding, reported in N. 49° 10', W. 29° 0', barometer, 29.53 (750.0), being a fall of .35 inch; winds shifting from sw. to nw.; squally. On the same day the bark "Gloire," T. E. Blagdon commanding, in N. 48° 40', W. 20° 0', had a shift of wind from w. to sse., with falling barometer, and rain-squalls. By the following day the centre of disturbance had moved eastward, and was apparently central in Ireland.

4.—This was probably a continuation of the depression described as low area ii. under "Areas of low barometer." It crossed the Gulf of Saint Lawrence during the 5th, causing strong w. and nw. breezes to moderate gales in its southwest quadrant, and by the 6th it was central near N. 50°, W. 48°, the minimum pressure reported being 29.2 (741.7); as moderate gradients existed to the eastward of the centre, the winds did not exceed the force of a strong breeze. During the 6th the centre of disturbance appears to have moved south-eastward, and by the 7th the region of least pressure was near N. 47°, W. 42°, where the barometer ranged from 29.1 (739.1) to 29.27 (743.4), with light to moderate variable winds in that vicinity, and moderate n. gales to the westward of W. 45°. By the 8th the area of low barometer had moved northeastward and was shown near N. 51°, W. 35°, the barometric readings in that neighborhood ranging from 29.35 (745.5) to 29.55 (750.6); moderate to strong s. and sw. winds prevailed over the Atlantic from W. 25° eastward to the Irish coast, and w. and nw. winds were reported from W. 35° westward to the fifty-fifth meridian. By the 9th the disturbance had passed northward beyond the fifty-fifth parallel, the lowest observed barometric reading on that date being 29.48 (748.8), in N. 57°, W. 22°.

5.—This was a continuation of the depression traced over the United States and Canada, and described as low area iv., under "Areas of low barometer." On the 8th it was shown as a shallow depression, central near the Strait of Belle Isle. It moved eastward with decreasing pressure, and on the 9th, was central between N. 50° and 55° and near the fortieth meridian; the lowest reported barometer reading was 29.46 (748.3), wind ne., in N. 55°, W. 42°; on the fiftieth parallel and between W. 35° and 45°, the winds were sw. and nw., moderate to strong in force. On the 10th and 11th the disturbance was north of N. 56° and west of the twenty-fifth meridian, the barometric readings from two vessels in that latitude being, respectively, 29.49 (749.0) and 29.68 (753.9), with sw. winds. On the 10th, the ship "Friedlander," in N. 55°, W. 24°, had a heavy gale from s. to w., in which she lost sails, and on the 11th, the ship "Carl," in N. 59° 04', W. 24° 56' had heavy gale from sw. to s., losing lower topsails.

6.—During the 10th a considerable decrease of pressure appears to have occurred over the ocean between N. 40° and 50° and W. 30° and 40°, and by the morning of the 11th the winds had shifted to e. and se., and the pressure in that region

ranged from 29.5 (749.3) to 29.6 (751.8). Northerly winds prevailed to the westward of W. 40°, and southerly winds to the eastward of W. 30°, but in the absence of steep barometric gradients, they remained moderate in force. By the morning of the 12th the pressure had decreased to 29.15 (740.4), the minima being shown near N. 46°, W. 30°. Moderate to strong n. and nw. gales now prevailed over the region between W. 35° and 45°, and N. 45° and 50°, with moderate to strong e., se., and s. breezes to the eastward of W. 35°. The reports for the 13th showed the area of low pressure to be near N. 51° W. 27°, but the depression was apparently filling in, and by the following day it had disappeared from the chart.

7. This disturbance, which was probably closely connected with the cyclone described as 2, has been traced as a separate disturbance, owing to absence of reliable reports between the 10th and 12th. On the last mentioned date the bark "Friedrich Seala," in N. 29°, W. 54°, had a severe gale from sse. to ssw., during which she lost several spars; and the brig "Emanuele," on the 13th, in N. 28° 40', W. 52° 37', had a gale from ssw., which lasted several days, causing much damage to the vessel. Vessels on the twenty-fifth parallel and near W. 58° had clear weather, with light w. and wnw. winds and high barometer. On the 14th the disturbance, having moved northeastward, was encountered by the brig "D. A. Small," in N. 32°, W. 46°, and by the s. s. "Marseille," in about N. 35°, W. 46°. The former vessel had winds of hurricane force from ssw., and lost sails, etc., and was under bare poles for five hours. The log of the s. s. "Marseille," L. Ruellan commanding, gives the following data: ship's position at noon, N. 34° 50', W. 46° 05'; at 1 p. m., barometer 29.76 (756.0), wind s., force 6; 2 p. m., barometer 29.45 (748.0), wind se.; 3 p. m., barometer 29.29 (744.0), wind ese., force 8. From that hour until 5 p. m. the barometer fell to 29.02 (737.0), at which reading it remained stationary until 6 p. m., the wind increasing from ese. until it reached a force of 10. At 7 p. m. the wind was wnw., force 10, and blew from that direction until 9 p. m., barometer rising; at 10 p. m., wind w., force 9; 11 p. m., w., force 8; midnight, w., force 7, barometer 29.61 (752.0). During the storm the sea was very heavy and caused some slight damage to the vessel. On the 15th the s. s. "Weser," H. Bruns commanding, reported, in N. 42° 54', W. 38° 17', barometer 29.50 (749.3), a fall of .57 inch, wind shifting from sw. to se., force 5 to 6. On the 16th the region of least pressure was near N. 50°, W. 27°, attended by moderate s. to sw. gales, and rising barometer; by the following day the depression had apparently filled in.

8.—This storm, which was remarkable on account of the abnormal path of the centre, is a continuation of that described under "Areas of low barometer" as number vii. It apparently developed off the coast of Florida on the 10th, the earliest marine data in connection therewith being the report of Captain Vogel, of the s. s. "City of Palatka," running between Jacksonville, Florida, and Charleston, South Carolina, as follows: "Weather on the coast last night (9th) from Charleston to about fifteen miles south of Savannah, heavy sea bearing in from ese., and wind at the time from ne. to ene., force from 8 to 19 knots, the latter during squalls of rain and wind; overcast and very cloudy. The wind did not back to wnw. before 7 a. m. of the 11th."

The s. s. "Guadalupe," at Key West, Florida, on the 11th, had fine weather until the night of the 10th, when she had light rains and wind squalls between the Bahamas and the Florida peninsula. Other vessels plying between Havana and Key West reported pleasant weather during the early part of September.

During the 11th and 12th the storm-centre appears to have moved inland and was in South Carolina, being attended by very heavy rains at stations on the south Atlantic coast; during the last-mentioned date it moved off the coast into the Atlantic, where it rapidly increased in intensity and exhibited the characteristics of a tropical hurricane. Captain Percy, commanding the s. s. "Algiers," between N. 27° 55', W. 79°

35', and N. 36° 15', W. 74° 40', from the 11th to 14th, reported a phenomenal backing of the wind from sw. on the 11th, by way of e., to nne. on the 13th.

During the 12th, the wind shifted to ne. at stations on the North Carolina coast, and blew with the force of a strong breeze; by the 13th the ne. winds were felt at sea, where they increased to moderate or strong gales. Southerly and southeasterly winds were reported by vessels south of N. 35° and east of W. 73°. During the 13th, the following vessels experienced the severity of the ne. gales: the bark "Alabama," in N. 31° 30', W. 78° 30', had a heavy ne. gale lasting seventeen hours, during which she had decks swept, spars and sails carried away, and sustained other damage. The schooner "Five Brothers," about one hundred and forty miles east of Charleston, lost and split sails during a heavy ne. gale, which lasted forty-eight hours, and the small steamer "Dos Hermanos," was wrecked on the Frying Pan shoals, off the North Carolina coast, during the same gale.

During this day the atmospheric depression seems to have been of small diameter, as vessels bound southward, and those to the eastward, observed little or no barometric indication of the existence of so severe a storm. The disturbance moved southeastward; its course and the position of the centre being shown by the report of the German bark "Paul," on the 14th. The following is an extract from the log of that vessel for September 14 and 15, 1884, furnished by Captain Aug. Klatt:

Sunday 14th.—4 a. m., strong wind from wsw., lightning in nw., barometer, 30.20 (767.1); 5 a. m., blowing strongly from w. and nw., barometer, 29.85 (758.2); 8 a. m., ship on beam-ends, no sail set, blowing fearfully, barometer, 29.60 (751.8); 12 noon (N. 29° 10', W. 75° 0'), no sail set, very high sea, barometer, 29.50 (749.3); 4 p. m., same weather; some of the well-fastened sails were blown to pieces on the yards, ship all the time on her beam-ends, barometer, 29.20 (741.7); 6 p. m., weather moderating, barometer, 29.20 (741.7); 8 p. m., calm, high sea running, sky very bright, but barometer falling, 29.00 (736.6); 11 p. m., wind fell out from ne. with very heavy rain, barometer, 29.00 (736.6).

Monday, 15th.—12 morning, wind wearing back to nne., terrific squalls, rising barometer, 29.15 (740.4); 4 a. m., wind n., blowing at its strongest, heavy rain, barometer, 29.20 (741.7); 8 a. m., wind nne., blowing at its strongest, heavy rain, barometer, 29.35 (745.5); 12 noon, wind nw., full gale, barometer, 29.50 (749.3); 4 p. m., wind nw., full gale, barometer, 29.55 (750.6); 8 p. m., wind nw., moderating at times, barometer, 29.70 (754.4); 12 midnight, wind wnw., moderating, very high sea, barometer, 29.80 (756.9). Ship's position at the finish of the hurricane, N. 27° 20', W. 73° 50'. Lost a whole suit of sails and had everything movable swept from the deck.

Captain Brown, commanding the s. s. "Grip Fast," reported: 14th, in N. 29° 14', W. 74° 48', at 4 a. m., wind sw., fresh; 8 a. m., shifted to nw. in a heavy gale, with high sea, barometer 29.8 (756.9); at 4 p. m., barometer 29.7 (754.4); 8 p. m., 29.5 (749.3), wind shifted to ne. and blew a strong gale, with thick, heavy rain squalls; at 2 p. m., lost foresail, jib, and maintopmast stay-sail, and at 4 p. m., shipped a heavy sea, which completely filled the engine room and stoke hole.

The schooner "R. M. Walls," in about N. 33° 20', W. 75° 0', at noon of the 14th reported strong ne. wind with very high sea, barometer 30.1 (764.5), remaining stationary during the entire day; sun occasionally visible through mist and cloud.

The s. s. "Valencia," Samuel Hess, commanding, reported, "14th, in N. 29° 30', W. 70° 35', barometer 29.9 (759.4) wind s. by e., force 8, heavy sea from ssw.; at 9.45 wind suddenly veered to ssw. in a squall of hurricane force, with heavy rain and lightning; remainder of the day strong gales and squalls."

On the same date the schooner "Carrie E. Woodbury," L. Bryant, commanding, in N. 30° 40', W. 70° 05', had barometer 30.04 (763.0), wind e., force 6.

Captain R. de Echevarrieta, commanding the s. s. "Andes," reported as follows: at 5 a. m., on September 14th, the wind shifted from sse. to n. and increased in force very rapidly, with heavy rain and occasional flashes of lightning; after 3 p. m., the wind shifted gradually from n. until it reached ene. at 6 p. m. at which time it blew strongest; hove to from 8 p. m. till morning of the 15th; barometer at midnight 29.73 (755.1); ship's position at noon of the 14th, N. 30° 49', W. 74° 27'.

Strong ne. gales continued over the region north of the



thirty-third parallel and west of the seventieth meridian, and numerous disasters to shipping were reported.

The position of the storm-centre on the 15th cannot be determined from the data as yet to hand, but the following reports show its presence, probably at no great distance east of the schooner "R. M. Walls," in about N. 29°, W. 74°. That vessel, in N. 29° 27', W. 75° 29', had the wind about n. by e., barometer falling from 30.0 (762.0) at 11 a. m. to 29.35 (745.5) at 1 p. m.; during this time the air was full of mist and vapor, and a very heavy cross sea was running.

The s. s. "Grip Fast," in N. 30°, W. 75°, had a ne. hurricane all day, with barometer slowly rising from 29.8 (756.9) at 4 a. m. to 29.9 (759.4) at 4 p. m.

The s. s. "Andes," in N. 31° 22', W. 74° 46', had wind and sea slightly moderating, barometer 29.88 (758.9), wind from n. to e.

The schooner "Bonanza," in N. 31° 27', W. 77° 46', had heavy sea and strong easterly gale throughout the day.

Schooner "Carrie E. Woodbury," in N. 31° 5', W. 70° 50', reported barometer 29.94 (760.5), wind ene., force 7.

Captain Bryant, of the brig "Rachel Conley," reported: "on the 15th, at 10 a. m., very heavy rain and squalls, heavy cross sea, thunder and ball lightning around the horizon. The barometer stood at 30.1 (764.5), with slight variation, rising or falling, during the day; wind from se. to sw., blowing with great force during squalls; calm at intervals and then squalls. The weather continued the same during the 16th, with occasional calms and very high cross sea; barometer rose to 30.2 (767.1). Ship's position at noon of the 15th, N. 28° 04', W. 68° 16'; at noon of the 16th, N. 28° 55', W. 68° 23'."

An extract from the log of the Spanish steamer "Serra," in N. 31° 51', W. 76° 12', at noon of the 15th, states: "day began with tempestuous wind from nne., very heavy sea from n. and e., barometer 30.0 (762.0); at 8 hours, barometer 29.9 (759.4), sky of a hurricane-like appearance, wind from ne.; at 10 hours, barometer 29.7 (754.4); 14 hours, barometer read 29.6 (751.8), with confused sea from e., ne., and sw.; at 20 hours, barometer 29.2 (741.7)."

During the 15th the storm-centre appears to have moved very slowly southward. Its position on the 16th is indicated by the report of the schooner "R. M. Walls." The latitude and longitude of the schooner at the time she encountered the central calm are not stated; her position, however, may be approximately given as being between N. 28° and 29° and W. 74° and 75°. At midnight of the 15th the barometer read 29.20 (741.7). At 11.30 a. m. of the 16th the gale was at its height, barometer 29.18 (741.2), wind about n.; it then suddenly died out, leaving the vessel "wallowing in a dead calm in the trough of a very heavy sea," rain squalls passing. After about five minutes, during which the calm lasted, the wind suddenly burst out from wsw. and the barometer rose to 29.25 (742.9), but shortly fell again to 29.18 (741.2), at which reading it remained until 4 a. m. of September 17th, when it began to rise and the sea moderated. At noon of the 17th the ship was in N. 27° 50', W. 75° 59'. At sunset of that day the weather was clear, but the sky around the horizon was perfectly green; barometer 30.00 (762.0).

The s. s. "Serra" appears to have been in close proximity to the centre during the afternoon of the 16th. At noon of that date she was in N. 30° 40', W. 76° 3', and was on a southerly course. At 2 hours the barometer read 29.10 (739.1), wind n.; 4 hours, barometer 29.00 (736.6), wind extremely baffling; 6 hours, barometer stationary, wind nw.; 7 hours, barometer 29.05 (737.9). After this the barometer rose gradually and the wind moderated. Latitude on the 17th, 27° 30' N., longitude 75° 28' W.

The data are insufficient to determine the position of the storm-centre on the 17th, but the circulation of the winds, as shown by the reports at hand, seems to indicate that the centre had moved northward and was then north of the thirtieth parallel. The brig "Emeline," in N. 31° 01', W. 65° 12', had fresh sw. breezes; the schooner "Bonanza," N. 30° 20', W.

77° 48', had w. and nnw. gale with rain squalls; schooner "Carrie E. Woodbury," in N. 31° 12', W. 70° 30', had barometer 29.74 (760.5), wind ssw, force 7; s. s. "Muriel," in N. 30° 45', W. 69° 24', barometer 29.94 (760.5), wind sw., force 5; s. s. "San Marcos," in N. 29° 22', W. 79° 20', barometer 29.99 (761.7), wind nw., force 6.

On the 17th, the s. s. "Andes," in N. 32° 20', W. 75° 0', had barometer 29.64 (752.8), wind shifting from ene. to nw., weather clearing. At stations on the south Atlantic coast south of Hatteras the winds shifted to nw. and wnw., while vessels at sea, north of the thirty-fifth parallel, had strong ne. and nne. gales.

During the 17th, the s. s. "Benvenue," when about 400 miles ese. of Sandy Hook, encountered a hurricane, beginning at ssw., veering to s., e., and n., and lasting for 6 hours, during which the wind blew with great violence.

On the 18th the schooner "Anna Bell" had a heavy gale in N. 36°, W. 62°, during which she lost sails, had decks swept, and sustained damage to rigging; and on the 20th the bark "Haleyon" was abandoned in N. 40°, W. 60° 50', having encountered a hurricane from se. to nw. on the 18th, which reduced the vessel to a wreck.

These are the only reports which indicate the presence of this disturbance on the 18th; on that day westerly winds and pressures about 30.0 (762.0) prevailed over the ocean south of N. 33°, while easterly winds and low barometric readings were reported near the fortieth parallel.

On the 19th the disturbance was shown, with a well-defined cyclonic movement of the winds, near the Banks of Newfoundland; the following reports indicate its severity during this date:

The bark "Wellington," in about N. 42° 26', W. 55° 14', reported strong sw. wind and heavy sea; in the evening the wind increased to a hurricane from e., and at midnight it died out and backed to n. and then blew with renewed force until 4 a. m., when it was w. and moderating. The barometer fell from 30.2 (767.1) to 29.0 (736.6) in twelve hours.

The bark "Cito," on the 19th, near N. 44°, W. 50°, reported a terrific hurricane from ssw., which lasted for three hours, during which the vessel lost several sails; after a short lull the wind suddenly shifted to n., nnw., and wnw., and blew as fiercely as before, with a very heavy cross sea; the wind then gradually moderated, and was followed by fair weather. No record of the barometer was kept, but the officers of the vessel stated that the barometer fell nearly one inch during the hurricane and rose rapidly when the wind changed.

Captain Albers, commanding the s. s. "Rugia," reported, in about N. 44° 16', W. 53° 58': 3 a. m., wind southerly, weather threatening, rainy, barometer falling, minimum 29.57 (751.1), force of wind, 3 to 7. At 4.30 a. m. wind shifted from n. to nne., force 7, weather clearing, barometer rising. The wind afterward shifted to nw. and decreased in force. From 8 a. m. to noon a high sw. sea prevailed.

The ship "J. T. Berry," in about N. 41°, W. 58°, reported, 7 p. m., wind hauling from sse. to wnw. and blowing with hurricane force with very high sea; ship lost sails and spars.

Several vessels reported heavy weather on the southern edge of the Banks. By the 20th the pressure had increased to 30.2 (767.1) and above, over the region east of the fortieth meridian, and the area of low barometer was shown near N. 51°, W. 25°, where the readings ranged from 29.69 (754.1) to 29.90 (759.4), with moderate to strong nw. winds near W. 30° and w. winds on the fiftieth parallel. By the 21st the area of low pressures was to the northwestward of Ireland.

9.—This was probably a continuation of low area vi., which passed over the United States and Canada. On the 12th the centre of disturbance was near the Strait of Belle Isle, and by the 13th it had passed to the northeastward of Labrador and beyond the range of the observations. During its passage it caused strong gales from n. and wsw.; the s. s. "Ontario," W. P. Couch commanding, reported, in N. 53° 34', W. 48° 49', barometer 29.27 (743.4), wind wsw., force 6; at 1 a. m. of the 14th (100 miles east of Belle Isle), the barometer fell to 29.17

(740.9), and the wind blew with the force of a strong gale from nne.

10.—This is a continuation of the disturbance described as low area ix., under "Areas of low barometer." It passed over southern Labrador during the 17th, and on the 18th it was shown near N. 54°, W. 52°, in which region the pressure ranged from 29.38 (746.2) to 29.53 (750.6). It moved eastward during the day, and on the 19th its presence was indicated by the reports as near N. 53°, W. 42°, where the pressure was about 29.6 (751.8); after the 19th this disturbance cannot be traced as a distinct depression, having probably merged in low area 8, which appeared to the southeastward.

11.—On the 24th the reports of the barks "Daphne" and "Betzy" indicated the presence of a disturbance near N. 42°, W. 40°, both vessels having encountered winds of hurricane force on that date. By the following day the disturbance had reached N. 52°, W. 20°, in which region a decrease of pressure averaging .45 inch had occurred since the observation of the 24th. The s. s. "Saint Laurent," M. de Jouselin commanding, reported as follows: 24th. During the afternoon the barometer began to fall rapidly, with s. wind of force 5; at 2.20 p. m. it read 29.93 (760.2), and at 10.20 p. m. 29.77 (756.2). From midnight to 2 a. m. of the 25th the wind shifted from e. to ne. and slightly moderated. At 2.15 a. m. it suddenly shifted in a squall to nw. and blew with hurricane force for two hours. The barometer began to rise immediately after the change of wind. At 5 a. m. the weather cleared, but the wind continued to blow with a force of 8 until 3 p. m. when it moderated. At 2.30 a. m. of the 25th, in N. 50° 06', W. 31° 16', the lowest barometer reading was 28.79 (731.2), and by noon of that date it had risen to 29.85 (758.2). The bark "Amelia," in N. 46° 00', W. 37° 30', had a hurricane which lasted six hours, with barometer falling to 28.6 (726.4). Very heavy gales continued during the 25th and 26th over the region between N. 50° and 60° and W. 20° and 30°, the winds being from s. and sw. on the twentieth meridian and from w. and nw. in W. 30°. By the 27th the disturbance was near the British coasts.

12.—This is a continuation of the disturbance described as number xiii., under "Areas of low barometer." It passed northeastward over Labrador during the 25th, and was shown to the northward of N. 55° on the following day. On the 26th the bark "Fluorine," A. Wilson commanding, in N. 55° 04', W. 49° 20', reported barometer 29.3 (744.2), a fall of .36 inch, wind wnw., force 4, rough sea and cloudy weather. By the 27th the disturbance had passed beyond the range of the observations.

13.—This was a continuation of low area xv. It moved over the Gulf of Saint Lawrence during the 29th, and at the close of the month it appeared central off the eastern coast of Newfoundland, the lowest recorded pressure being 29.36 (745.7), wind sw., force 4. Strong s. breezes to moderate gales were reported over the ocean from W. 50° eastward to W. 40°, with moderate w. breezes to the southward of the Banks.

#### OCEAN ICE.

Chart i. also exhibits the southern and eastern limits of the region within which icebergs were observed in the north Atlantic ocean during the month of September, 1884. These limits are determined from reports sent to this office by shipmasters; reports furnished through the co-operation of the "New York Herald Weather Service," and from other data published in the "New York Maritime Register."

In September, 1884, the southern limit of the ice-region was about N. 46°, and its eastern limit was near W. 49°. Few icebergs have been observed in the routes of trans-Atlantic steamers, but large masses of ice are reported near the eastern coast of Newfoundland; they are also reported on the southern coast, between Cape Race and Saint Pierre. Icebergs were also encountered between W. 40° and 45° and north of the fifty-fifth parallel.

As compared with the chart for the preceding month (August),

there has been a notable decrease in the extent of the ice-region; its eastern limit in September being about 5° west of that for the preceding month, while its southern boundary is about 2° 30' north of the August limit.

In September, 1883, not more than half a dozen icebergs were observed within the region between W. 44° and the Newfoundland coast, and none were reported south of N. 48°. In the same month of 1882 no icebergs were reported.

Icebergs were observed during September, 1884, as follows:

Captain D. Thoms, commanding the brigantine "Corisande," reported: "August 31st, passed a large number of icebergs within a radius of twenty miles of Bonavista light house; about twenty miles sse. of Bonavista passed a large ice-land about four miles long, extending from e. to w., and about two miles broad, and having a height of from 100 to 200 feet. As we continued on our course we passed a large number of large and small bergs, until off Fogo, when the vessel had to be steered clear of broken ice for about six miles; then got into clear water. On September 4th, arrived at Loup Bay, Labrador, passing four small icebergs in the Strait of Belle Isle; on the 25th, in N. 51° 35', W. 54° 40', passed a large iceberg, and on the 27th saw a large ice-land and several small bergs off Cape Spear."

September 2d.—Captain Wilson, commanding the bark "Fluorine," reported: "On the 2d passed a large iceberg in N. 48° 50', W. 50° 49'. 3d.—In N. 51° 43', W. 50° 50' also passed a large iceberg; same day, from N. 51° 56' to N. 52° 32', passed eight icebergs within four miles of vessel's track on a due north course. September 5th, sighted a few icebergs near the Greenland coast. On the 8th, 9th, and 10th very many icebergs in sight."

September 4th.—S. S. "Lake Huron," from 180 miles east of Belle Isle to Belle Isle, passed several large and small icebergs.

10th.—S. S. "Lord Gough," in N. 47° 39', W. 49° 14', passed a large but low iceberg.

19th.—Bark "Armenia," in N. 56°, W. 40° to 45°, passed six icebergs.

24th.—S. S. "Norwegian," off Cape Race, passed three large icebergs.

British s. s. "Bristol," from Montreal for Bristol, at Saint John's on September 27, reported having passed three hundred and seventy-five icebergs between Cape Freels and Cape Race.

28th.—S. S. "Saint Laurent," fifteen miles ese. of Cape Race, passed an iceberg.

October 2d.—S. S. "Illinois," in N. 46° 06', W. 53° 21', passed several large and small icebergs. Schooner "Busiris," at North Sidney, reported having seen forty-three large and small icebergs between Cape Spear and Cape Race.

3d. S. S. "Normandie," from N. 46° 27', W. 55° 21' to N. 46° 18', W. 55° 51', passed thirteen icebergs, some of large dimensions.

#### TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada, for September, 1884, is exhibited on chart ii., by the dotted isothermal lines; and chart iv. shows the departures from the September normal. From an examination of the last-named chart it will be seen that the mean temperature is above the normal at all stations east of a line running from southern New Mexico, near El Paso, Texas, to the northern boundary of Dakota, with the exception of Jacksonville and Key West, Florida, where the temperature is slightly below the normal. Over an area extending from northern Texas, northeastward to the lake region and Ohio valley, the mean temperatures are from 5° to 6° above the normal. To the westward of the line of normal temperature, the means are below the September normal, the departures being marked in the northern and middle plateau districts and in the north and middle Pacific coast regions.

In the following table are shown for each of the several geo-



graphical districts, the normal temperatures for the month of September for a series of years; the mean temperatures for September, 1884, and the departures from the normal, as deduced from the records of the Signal Service:

*Average temperatures for September, 1884.*

Districts.	Average for Sept. Signal-Service observations.		Comparison of Sept., 1884, with the average for several years.
	For several years.	For 1884.	
New England.....	61.7	64.6	2.9 above.
Middle Atlantic states.....	64.7	71.0	3.3 above.
South Atlantic states.....	74.1	75.7	1.6 above.
Florida peninsula.....	80.1	80.1	normal.
Eastern Gulf states.....	74.7	77.4	2.7 above.
Western Gulf states.....	75.8	79.4	3.6 above.
Rio Grande valley.....	80.8	81.5	0.7 above.
Tennessee.....	70.0	74.2	4.2 above.
Ohio valley.....	67.2	72.3	5.1 above.
Lower lake region.....	62.2	65.9	3.7 above.
Upper lake region.....	58.5	62.0	3.5 above.
Extreme northwest.....	54.5	55.4	0.9 above.
Upper Mississippi valley.....	59.2	59.5	0.3 above.
Missouri valley.....	61.6	65.2	3.6 above.
Northern slope.....	56.2	53.6	2.6 below.
Middle slope.....	64.1	68.0	3.9 above.
Southern slope.....	70.1	74.2	4.1 above.
Southern plateau.....	73.0	70.8	2.2 below.
Northern plateau.....	59.2	54.5	4.7 below.
North Pacific coast region.....	58.3	55.3	3.0 below.
Middle Pacific coast region.....	67.3	69.5	2.2 below.
South Pacific coast region.....	74.9	70.2	4.7 below.
Mount Washington, N. H.....	40.7	41.4	0.7 above.
Pike's Peak, Colo.....	31.2	32.0	0.8 above.
Salt Lake City, Utah.....	64.9	58.8	6.1 below.

The following are some of the highest and lowest monthly mean temperatures reported from the Signal Service stations:

Stations reporting highest.		Stations reporting lowest.	
Galveston, Texas.....	83.5	Pike's Peak, Colorado.....	32.0
Rio Grande City, Texas.....	82.7	Mount Washington, New Hampshire.....	41.4
Key West, Florida.....	82.2	Fort Klamath, Oregon.....	43.8
Indianola, Texas.....	81.0	Fort Maginnis, Montana.....	47.1
New Orleans, Louisiana.....	80.9	Lake View, Oregon.....	47.8
Brownsville, Texas.....	80.3	Fort Shaw, Montana.....	48.1
Cedar Keys, Florida.....	80.3	Linkville, Oregon.....	48.8
Shreveport, Louisiana.....	80.2	Fort Bridger, Wyoming.....	49.3
Maricopa, Arizona.....	79.8	Helena, Montana.....	49.7
Palestine, Texas.....	79.6	Fort Assinaboine, Montana.....	50.2
Pensacola, Florida.....	79.5	Fort Spokane, Washington Territory.....	50.8
Montgomery, Alabama.....	79.0	Port Angeles, Washington Territory.....	51.0
Mobile, Alabama.....	78.3	Fort Bidwell, California.....	57.4

**DEVIATIONS FROM MEAN TEMPERATURE.**

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average temperatures for September, 1884. The following notes in connection with this subject are reported by voluntary observers:

**Arkansas.**—Lead Hill, Boone county: mean temperature, 76° 4, is 5° 6 above the September average for the last three years.

**Dakota.**—Webster, Day county: mean temperature 62° 6, is 4° 1 below the September average for the two preceding years.

**Illinois.**—Anna, Union county: mean temperature, 74° 6, is 5° 9 above the September average for the last nine years.

**Swanwick, Perry county:** mean temperature, 72° 3, is 3° above the average for the last three years.

**Mattoon, Coles county:** mean temperature, 73° 0, is 5° 7 above the September average for the four preceding years.

**Sycamore, De Kalb county:** mean temperature, 68° 8, is 5° 4 above the September average for the three preceding years.

**Riley, McHenry county:** mean temperature, 65° 2, is 5° 1 above the September average for the last twenty-three years; only September, 1865, was warmer.

**Collinsville, Madison county:** mean temperature, 72° 3, is 3° 2 above the September normal for this place.

**Indiana.**—Spiceland, Henry county: mean temperature, 70° 1, is 6° 4 above the September average for the last thirty-one years.

**Wabash, Wabash county:** mean temperature, 70° 5, is 7° 2 above the September average for the last nine years.

*Table of maximum and minimum temperatures for September, 1884.*

State or Territory.	Signal Service.			U. S. Army Post Surgeons, or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
Alabama.....	Montgomery.....	97	58	Mt. Vernon Barracks.....	97	57
Do.....	Mobile.....	94	61	Birmingham.....	93	54
Arizona.....	Wickenburg.....	105	39	Texas Hill.....	113	62
Do.....	Prescott.....	87	32	Benson.....	98	58
Arkansas.....	Fort Smith.....	100	59	Arkansas City.....	103	52
Do.....	Little Rock.....	93	58	Mount Ida.....	95	52
California.....	Red Bluff.....	95	46	Mammoth Tank.....	115	70
Do.....	Fort Bidwell.....	82	24	Cisco.....	79	30
Colorado.....	West Las Animas.....	95	37	Fort Lyon.....	95	27
Do.....	Pike's Peak.....	47	18	Fort Lewis.....	75	23
Connecticut.....	New Haven.....	90	40	Hartford.....	94	33
Do.....	New London.....	89	45	Southington.....	93	32
Dakota.....	Huron.....	90	36	Fort Randall.....	97	36
Do.....	Fort Buford.....	80	28	Fort Meade.....	83	20
Delaware.....	Del. Breakwater.....	88	55	Receiving Reservoir.....	98	46
District of Columbia.....	Washington City.....	97	45	Limona.....	90	69
Florida.....	Pensacola.....	94	65	Archer.....	89	65
Do.....	Key West.....	92	73	Washington.....	102	50
Georgia.....	Augusta.....	91	57	Mossy Creek.....	91	42
Do.....	Atlanta.....	88	52			
Idaho.....	Lewiston.....	82	38			
Do.....	Coeur d'Alene.....	74	31	Bunker Hill.....	100	44
Illinois.....	Springfield.....	91	51	Wilton Centre.....	92	43
Do.....	Chicago.....	89	50	Connersville.....	98	46
Indiana.....	Indianapolis.....	90	45	Princeton.....	95	45
Do.....						
Indian Territory.....	Fort Reno.....	98	50			
Do.....	Cantonment.....	98	60			
Iowa.....	Des Moines.....	92	43	Ottumwa.....	95	42
Do.....	Dubuque.....	92	47	Monticello.....	90	30
Kansas.....	Dodge City.....	92	46	Manhattan.....	102	52
Do.....	Leavenworth.....	90	49	Allison.....	97	32
Kentucky.....	Louisville.....	92	50	Frankfort.....	90	50
Louisiana.....	Shreveport.....	97	62	Point Pleasant.....	96	61
Do.....	New Orleans.....	92	70	Luling.....	93	59
Maine.....	Portland.....	88	40	Cornish.....	90	36
Do.....	Eastport.....	83	38	Orono.....	80	30
Maryland.....	Baltimore.....	93	49	Great Falls.....	96	46
Do.....	Ocean City.....	86	52	Woodstock.....	91	37
Massachusetts.....	Boston.....	94	40	Taunton.....	97	37
Do.....	Thatcher's Island.....	85	45	Heath.....	92	32
Michigan.....	Alpena.....	93	35	Mendon.....	98	44
Do.....	Port Huron.....	92	39	Hudson.....	95	32
Minnesota.....	Saint Paul.....	87	44	Chester.....	93	35
Do.....	Saint Vincent.....	80	32	Fort Snelling.....	95	38
Mississippi.....	Vicksburg.....	94	62	Hernando.....	100	50
Do.....				Milan.....	95	48
Missouri.....	Saint Louis.....	92	54	Harrisonville.....	99	60
Do.....				Centerville.....	92	38
Montana.....	Fort Benton.....	89	24	Fort Keogh.....	86	28
Do.....	Fort Shaw.....	80	21	Fort Ellis.....	85	25
Nebraska.....	Omaha.....	90	49	Red Willow.....	96	34
Do.....	North Platte.....	91	40	De Soto.....	91	39
Nevada.....				Goconda.....	98	41
Do.....				Elko.....	90	23
New Hampshire.....	Mount Washington.....	63	14	Readington.....	104	50
New Jersey.....	Sandy Hook.....	94	52	Vineland.....	92	43
Do.....	Cape May.....	84	48	Fort Union.....	82	33
New Mexico.....	Fort Craig.....	99	43	Fort Wingate.....	81	30
Do.....	Fort Stanton.....	83	35	Syracuse.....	99	47
New York.....	Rochester.....	92	38	Palermo.....	92	34
Do.....	Oswego.....	92	40	Salisbury.....	99	43
North Carolina.....	Wash Woods.....	94	78	Highlands.....	78	40
Do.....	Charlotte.....	91	49	College Hill.....	98	52
Ohio.....	Columbus.....	92	46	Wauseon.....	95	30, 5
Do.....	Toledo.....	92	47	Albany.....	74	44
Oregon.....	Ashland.....	90	34	Fort Klamath.....	76	16
Do.....	Fort Klamath.....	74	20	Easton.....	98	46
Pennsylvania.....	Pittsburg.....	100	44	Troy.....	91	27
Do.....	Erie.....	87	43	Providence.....	92	39
Rhode Island.....	Block Island.....	83	49	Nayatt Point.....	96	44
Do.....	Point Judith.....	80	42	Anderson.....	98	46
South Carolina.....	Charleston.....	89	62	Greenville.....	94	44
Tennessee.....	Memphis.....	94	61	Milan.....	97	50
Do.....	Knoxville.....	92	50	Ashwood.....	92	48
Texas.....	Rio Grande City.....	103	70	Fort Concho.....	101	63
Do.....	Fort Elliott.....	95	46	Clarksville.....	95	62
Utah.....	Salt Lake City.....	87	37	Nephi.....	85	28
Do.....	Fort Thornburg.....	86	32			
Vermont.....				Charlotte.....	92	40
Do.....				Newport.....	90	30
Virginia.....	Fort Myer.....	95	43	Dale Enterprise.....	97	42
Do.....	Lynchburg.....	94	47	Blacksburg.....	88	35
Washington Territory.....	Dayton.....	82	31	Fort Spokane.....	81	31
Do.....	Fort Spokane.....	78	27	Pleasant Grove.....	75	22
West Virginia.....				Helvetia.....	92	40
Wisconsin.....	Milwaukee.....	89	46	Beloit.....	92	42
Do.....	La Crosse.....	88	50	Prairie du Chien.....	90	46
Wyoming.....	Cheyenne.....	82	28	Fort Fred Steele.....	87	26
Do.....	Fort Bridger.....	78	22	Fort Bridger.....	78	19

**Logansport, Cass county:** mean temperature, 70° 4, is 4° 2 above the September average for the last twenty-five years.

**Iowa.**—Professor Gustavus Hinrichs of Iowa City, director of the "Iowa Weather Service," reports the following:

The mean temperature of the air was over 5° above normal, and almost equal to the mean temperature of August, just preceding. During the past forty-five years September was but once decidedly warmer, viz., in 1865,

and only three times has it been as warm, viz., in 1881, 1854, and 1851. The first decade was extraordinarily warm—exceeding the normal temperature by over 9°; the second decade was only 0.5° above normal; the third decade was again very warm, being nearly 6° above normal.

Monticello, Jones county: mean temperature, 66° 6, is 5° above the September normal for a period of forty-five years.

Kansas.—Lawrence, Sumner county: mean temperature, 7°

70° 4, is 4° 2 above the September average for the last twenty years.

Independence, Montgomery county: mean temperature, 73°, is 2° 6 above the September average for the last thirteen years.

Yates Centre, Woodson county: mean temperature, 73° 9, is 7° above the September average for the last four years.

Table of comparative maximum temperatures for the month of September.

State or Territory.	Maximum for September, 1884, Signal Service.		Maximum since Signal-Service stations were opened—3 to 13 years.		Highest from any other source.		
	Station.	Temperature.	Station.	Temperature.	Place.	Temperature.	Year.
Alabama	Montgomery	97	Montgomery	97	Mount Vernon Arsenal	98	Years.
Do	Mobile	94	Mobile	96	Mobile	96	33
Arizona	Fort McDowell	105	Burke's and Yuma	113	Camp McDowell	114	34
Do	Phoenix	105	Stanwix	111	Fort Mojave	109	14
Arkansas	Fort Smith	100	Fort Smith	99	Fort Smith	101	4
Do	Little Rock	93	Little Rock	97	Washington (near)	98	31
California	Red Bluff	95	Red Bluff	92	Fort Miller	114	28
Do	Sacramento	94	Los Angeles	104	Fort Yuma	111	13
Colorado	Denver	88	Denver	93	Fort Lyon	99	23
Do	Pike's Peak	47	Pike's Peak	55	Fort Garland	89	19
Connecticut	New London	99	New London	100	Columbia	94	30
Do	New Haven	99	New Haven	107	New Haven	92	10
Dakota	Fort Bennett	92	Fort Sully	100	Fort Randall	106	89
Do	Yankton	88	Yankton	100	Fort Sully	101	24
Delaware	Delaware Breakwater	88	Delaware Breakwater	93	Fort Delaware	90	17
District of Columbia	Washington City	97	Washington City	104	Washington City	95	45
Florida	Jacksonville	92	Jacksonville	95	Fort Jefferson	100	49
Do	Key West	92	Key West	94	Fort King	100	13
Georgia	Savannah	91	Savannah	97	Oglethorpe Barracks	99	10
Do	Augusta	91	Augusta	97	Augusta Arsenal	98	36
Idaho	Boise City	80	Boise City	92	Fort Boise	103	48
Do	Lewiston	80	Eagle Rock	92	Fort Lapwai	95	16
Illinois	Chicago	91	Chicago	97	Manchester	102	10
Do	Indianapolis	89	Indianapolis	94	Anna	102	11
Indiana	Indianapolis	90	Indianapolis	94	Laconia	101	7
Do	Fort Reno	98	Fort Gibson	104	Vevay	100	15
Do	Davenport	90	Davenport	94	Fort Gibson	103	52
Iowa	Keokuk	90	Keokuk	97	Fort Sill	103	4
Do	Dodge City	92	Dodge City	99	Muscantine	103	7
Kansas	Leavenworth	90	Leavenworth	101	Fort Madison	98	19
Do	Louisville	92	Louisville	99	Fort Riley	108	24
Kentucky	New Orleans	92	New Orleans	92	Fort Larned	104	14
Louisiana	Shreveport	97	Shreveport	101	Newport Barracks	90	28
Do	Eastport	83	Eastport	81	Fort Jesup	100	23
Maine	Portland	88	Portland	94	Point Pleasant	104	7
Do	Baltimore	93	Baltimore	101	Brunswick	96	53
Maryland	Ocean City	86	Boston	101	Portland	94	37
Massachusetts	Boston	94	Springfield	94	Fort Washington	99	38
Do	Thatcher's Island	85	Detroit and Marquette	97	Baltimore	98	37
Michigan	Detroit	89	Detroit and Marquette	97	Fort Warren	100	18
Do	Port Huron	92	Port Huron	97	Williamstown	95	55
Minnesota	Saint Paul	87	Saint Paul	94	Thornville	100	3
Do	Moorehead	84	Breckenridge	96	Fort Brady	98	51
Mississippi	Vicksburg	94	Vicksburg	98	Fort Snelling	92	60
Do	Saint Louis	92	Saint Louis	101	Fort Ripley	92	14
Missouri	Saint Louis	92	Saint Louis	101	Fayette	98	6
Do	Fort Canby	85	Fort Keogh	99	Vicksburg	95	4
Montana	Fort Shaw	80	Fort Shaw	91	Saint Louis	101	41
Do	Omaha	90	Omaha	99	Allenton	100	4
Nebraska	North Platte	91	North Platte	101	Tongue River	103	3
Do	Pioche	92	Pioche	92	Fort Shaw	92	10
Nevada	Mount Washington	63	Mount Washington	95	Clear Creek	103	9
Do	Mountain View	63	Mountain View	95	Genoa	103	8
New Hampshire	Mountain View	63	Mountain View	95	Fort McDemitt	96	15
Do	Sandy Hook	94	Sandy Hook	101	Dartmouth College	92	18
New Jersey	Atlantic City	86	Atlantic City	94	Auburn	95	6
Do	Fort Craig	99	Santa Fe	90	Atco	104	7
New Mexico	Fort Stanton	83	Santa Fe	105	Vineland	104	9
Do	Rochester	92	La Mesilla	105	Fort Craig	103	26
New York	New York City	92	Rochester	98	Fort McRae	103	10
Do	Wilmington	91	New York City	100	Poughkeepsie	100	20
North Carolina	Kitty Hawk	88	Wilmington	95	Penn Yan	102	16
Do	Cleveland	89	Kitty Hawk	95	Fort Johnson	98	54
Ohio	Columbus	92	Cleveland	98	Fort Macon	92	15
Do	Ashland	90	Columbus	98	College Hill	102	6
Oregon	Portland	73	Unatilla	95	Cincinnati	99	35
Do	Philadelphia	94	Portland	95	Fort Hoskins	98	9
Pennsylvania	Philadelphia	100	Philadelphia	101	Fort Yamhill	95	9
Do	Point Judith	86	Pittsburg	101	Milton	105	3
Rhode Island	Block Island	83	Newport	88	Philadelphia	93	123
South Carolina	Charleston	89	New Shoreham	86	Providence	90	36
Tennessee	Memphis	94	Charleston	94	Fort Adams	96	42
Do	Nashville	91	Memphis	98	Fort Moultrie	93	38
Texas	Rio Grande City	103	Nashville	98	Humboldt	97	4
Do	El Paso	98	Rio Grande City	107	Ashwood	100	3
Utah	Salt Lake City	87	El Paso	104	Fort Stockton	109	21
Vermont	Fort Myer	95	Salt Lake City	93	Fort McIntosh	106	24
Do	Lynchburg	94	Burlington	90	Fort Douglas	97	19
Washington Territory	Olympia	70	Fort Myer	102	Charlotte	94	7
Do	Dayton	52	Lynchburg	96	Acrotink	104	7
West Virginia	Almota	94	Olympia	81	Fortress Monroe	97	48
Do	Morgantown	91	Almota	94	Fort Walla Walla	98	10
Wisconsin	Milwaukee	89	Morgantown	91	Fort Vancouver	94	18
Do	La Crosse	88	Milwaukee	94	Flemington	99	5
Wyoming	Cheyenne	82	La Crosse	92	Fort Howard	98	30
Do	Cheyenne	82	Cheyenne	88	Fort Winnebago	91	14
					Fort Laramie	99	26



Wellington, Sumner county: mean temperature, 74°.5, is 5°.5 above the September average for the last six years.

*Maine.*—Gardiner, Kennebec county: mean temperature, 59°.8, is 1°.3 above the September average for the last forty-five years.

*Maryland.*—Fallston, Harford county: mean temperature, 69°.4, is 4°. above the September average for the last thirteen years, and is the highest for that period; the next highest being 67°.9 for September, 1874.

*Massachusetts.*—Worcester, Worcester county: mean temperature, 62°.1, is 0°.9 above the September average for the last forty-five years. The highest September mean temperature for the period above mentioned, 69°.6, occurred in 1881; the lowest, 56°.7, occurred in 1883.

*Missouri.*—Saint Louis: mean temperature, 74°.7, has been exceeded but three times since 1854, viz: 76°.0, in 1854; 74°.9 in 1865, and 76°.2 in 1881.

*New Jersey.*—South Orange, Essex county: mean temperature, 67°.7, is nearly 4° above the September average for the last fifteen years.

Moorestown, Burlington county: mean temperature, 68°.8, is 3°.8 above the September average.

*New York.*—Palermo, Oswego county: mean temperature, 62°.0, is 1°.1 above the September average for the last thirty-one years. The highest monthly mean temperature for the period above mentioned, 67°.8, occurred in 1881; the lowest, 54°.0, occurred in 1867.

North Volney, Oswego county: mean temperature, 65°.5, is 4°.9 above the September average for the last seventeen years.

*Ohio.*—Wauseon, Fulton county: mean temperature, 67°.8, is 5°.2 above the September average for the last fourteen years, and is, with the exception of September, 1881 (mean temperature 71°.1), the highest for that period; the lowest, 57°.2, occurred in 1883.

*Pennsylvania.*—Dyberry, Wayne county: mean temperature, 60°.8, is 0°.8 above the September average for the last eighteen years.

*Texas.*—New Ulm, Austin county: mean temperature, 80°.0, is 2°.3 above the September average for the last thirteen years.

*Virginia.*—Wytheville, Wythe county: mean temperature, 65°.5, is 2°.1 above the September average for a period of twenty years.

Variety Mills, Nelson county: mean temperature, 68°.9, is 2°.0 above the September average for the last seven years, and is, with the exception of 75°.2 for September, 1882, the highest for that period.

*West Virginia.*—Helvetia, Randolph county: mean temperature, 63°.3, is 1°.8 above the September for the last eight years.

#### MONTHLY RANGES OF TEMPERATURE.

The monthly ranges of temperature were greatest at Rocky mountain stations, in the upper Missouri valley, at the most northerly lake stations, in New England, Pennsylvania, Maryland, and northern Virginia, where they exceeded 50°. They were least along the immediate coast of the Pacific, at the Gulf stations, and on the Atlantic coast, south of Virginia. The extreme ranges vary from 16° at Galveston, Texas, and 18° at Key West, Florida, to 65° at Fort Benton, Montana, and 66° at Phoenix and Willcox, Arizona.

The following stations report ranges of 53° or more: Phoenix and Willcox, Arizona, 66°; Fort Benton, Montana, 65°; Fort Bennett, Dakota, 62°; Wickenburg, Arizona, 61°; Huron, Dakota, 60°; Fort Shaw, Montana, 59°; Fort Bidwell, California, 58°; West Las Animas, Colorado, 58°; Alpena, Michigan, 58°; Fort Yates, Dakota, 57°; Fort Thomas, Arizona, 57°; Ashland, Oregon, 56°; Fort Bridger, Wyoming, 56°; Fort Verde, Arizona, 56°; Fort Craig, New Mexico, 56°; Pittsburg, Pennsylvania, 56°; Fort Apache, Arizona, 55°; Fort McDowell, Arizona, 55°; Prescott, Arizona, 55°; Fort Klamath, Oregon, 54°; Fort Thornburg, Utah, 54°; San Carlos, Arizona, 54°; Fort Custer, Montana, 54°; Cheyenne, Wyoming, 54°; Fort Totten,

Dakota, 54°; Rochester, New York, 54°; Boston, Massachusetts, 54°; Port Huron, Michigan, 53°; Fort Maginnis, Montana, 53°.

Stations reporting monthly ranges of 30° or less are as follows: Cape Henry and Norfolk, Virginia, 30°; Olympia, Washington Territory, 29°; Portland, Oregon, 29°; Pike's Peak, Colorado, 29°; Pensacola, Florida, 28°; Linkville, Oregon, 28°; Savannah, Georgia, 28°; Charleston, South Carolina, 27°; Kitty Hawk, North Carolina, 27°; Brownsville, Texas, 27°; San Diego, California, 27°; Smithville, North Carolina, 25°; Cedar Keys, Florida, 23°; Jacksonville, Florida, 23°; Cape Mendocino, California, 23°; Fort Canby, Washington Territory, 22°; New Orleans, Louisiana, 22°; Fort Macon and Hatteras, North Carolina, 21°; Indianola, Texas, 21°; San Francisco, California, 21°; Key West, Florida, 18°; Galveston, Texas, 16°.

#### GREATEST DAILY RANGES OF TEMPERATURE.

The greatest daily ranges of temperature have varied in the several districts as follows:

*New England.*—From 20° on the summit of Mount Washington, New Hampshire, on the 12th, to 28° at Boston, Massachusetts, on 23d.

*Middle Atlantic states.*—From 19° at Atlantic City and Cape May, New Jersey, on the 15th and 21st, respectively, to 29° at Washington, District of Columbia, on the 15th.

*South Atlantic states.*—From 13° at Fort Macon, North Carolina, on the 17th, to 30° at Augusta, Georgia, on the 17th.

*Florida peninsula.*—From 14° at Key West, on the 14th, to 27° at Sanford, on the 17th.

*East Gulf states.*—From 17° at New Orleans, Louisiana, on the 12th, to 29° at Montgomery, Alabama, on the 17th.

*West Gulf states.*—From 12° at Galveston, Texas, on the 12th, to 36° at Fort Smith, Arkansas, on the 1st.

*Rio Grande valley.*—From 24° at Brownsville, Texas, on the 2d, to 30° at Rio Grande City, Texas, on the 1st.

*Tennessee.*—From 26° at Memphis, on the 2d, to 32° at Knoxville, on the 21st.

*Ohio valley.*—From 23° at Cincinnati, Ohio, on the 15th, to 39° at Pittsburg, Pennsylvania, on same date.

*Lower lake region.*—From 24° at Detroit, Michigan, on the 21st, to 33° at Rochester, New York, on the 2d.

*Upper lake region.*—From 23° at Escanaba, Michigan, on the 21st, to 32° at Alpena, Michigan, on the 9th.

*Extreme northwest.*—From 32° at Bismarck, Dakota, on the 27th, to 36° at Fort Totten, Dakota, on the 5th.

*Upper Mississippi valley.*—From 22° at Cairo, Illinois, on the 14th, to 31° at Des Moines, Iowa, on the 25th.

*Missouri valley.*—From 25° at Omaha, Nebraska, on the 29th, to 46° at Fort Bennett, Dakota, on the 11th.

*Northern slope.*—From 26° at Helena, Montana, on the 20th, to 43° at Fort Custer, Montana, on the 9th and 20th.

*Middle slope.*—From 20° on the summit of Pike's Peak, Colorado, on the 15th, to 49° at West Las Animas, Colorado.

*Southern slope.*—From 32° at Fort Stockton, Texas, on the 1st, to 37° at Fort Sill, Indian Territory, on same date.

*Southern plateau.*—From 29° at Fort Grant, Arizona, on the 29th, to 49° at Fort Apache, Arizona, on the 28th.

*Middle plateau.*—32° at Salt Lake City, Utah, on the 4th.

*Northern plateau.*—From 32° at Spokane Falls, Washington Territory, and Boise City, Idaho, on the 19th, to 38° at Dayton, Washington Territory, on the 16th.

*North Pacific coast region.*—From 14° at Fort Canby, Washington Territory, on the 12th, to 25° at Portland, Oregon, on the 17th and 26th.

*Middle Pacific coast region.*—From 16° at Cape Mendocino, California, on the 15th, to 34° at Red Bluff, California, on the 27th.

*South Pacific coast region.*—From 22° at San Diego, California, on the 15th, to 36° at Los Angeles, California, on the 16th and 19th.

## FROSTS.

Frosts occurred, during September, in the several states and territories as follows:

*Arizona*.—Fort Apache, 9th; Wickenburg, 8th; Prescott, 8th, 15th.

*California*.—Princeton, 9th; Hydesville, 29th; Sacramento, 30th; Fort Bidwell, 2d, 26th.

*Colorado*.—Fort Lewis, 15th, 16th, 17th, 18th, 26th, 27th; Grand Junction, 10th, 27th; Pike's Peak, 2d, 20th; Denver, 10th, 24th, 30th.

*Connecticut*.—Southington, 14th, 15th.

*Dakota*.—Webster, 11th, 20th; Fort Buford, 9th, 19th, 30th; Fort Totten, 24th, 30th; Bismarck, 7th, 27th, 30th; Fort Yates, 29th; Huron, 11th; Fort Bennett, 27th, 30th; Fort Sully, 28th, 30th; Deadwood, 16th, 20th.

*Idaho*.—Lewiston, 26th; Coeur d'Alene, 7th; Boise City, 3d, 6th, 15th, 16th, 25th, 29th.

*Illinois*.—Swanwick, 18th, 20th.

*Indiana*.—Logansport, 21st; Wabash, 21st, 25th.

*Iowa*.—Cresco, 17th, 18th, 20th, 25th; Independence, 11th, 18th, 20th; Logan, 20th; Monticello, 25th; Humboldt, 20th; Manchester, 12th, 18th; Maynard, 12th, 20th, 25th; Keokuk, 25th.

*Kansas*.—Allison, 11th, 17th; Sherlock, 17th.

*Maine*.—Cornish, 13th, 14th, killing vegetation on the latter date; Gardiner, 14th, 15th; Orono, 13th, 14th, 15th, 19th; Bangor, 13th, 14th, 15th, 19th; Eastport, 20th; Portland, 14th.

*Massachusetts*.—Milton, 14th; Somerset, 14th, 15th; Westborough, 14th, 15th, 27th; Williamstown, 12th, 13th; Heath, 14th; Rowe, 14th, 19th, killing tender vegetables on the first-named date; Taunton, 14th, 15th; Worcester, 14th, 15th.

*Michigan*.—Lansing, 21st, 22d, 25th; Thornville, 19th; Ionia, 1st, 26th; Swartz Creek, 12th, 18th, 20th; Hillsdale, 21st; Hudson, 21st; Mottville, 21st; Manistique, 20th; Grand Haven, 21st, Alpena, 14th, 19th, 21st, 23d; Port Huron, 19th; Marquette, 22d, 29th.

*Minnesota*.—Chester, 11th, 18th, 20th, 25th, 29th; Saint Vincent, 19th, 20th, 25th, 27th; Moorhead, 20th, 27th, 30th.

*Montana*.—Fort Maginnis, 7th, 26th, 29th, 30th; Fort Benton, 7th, 9th, 26th, 30th; Helena, 6th, 7th; Fort Shaw, 7th; Fort Assinaboine, 7th, 9th, 29th, 30th; Fort Custer, 30th; Poplar River, 4th, 9th, 30th.

*Nebraska*.—Fort Robinson, 9th; Genoa, 11th, 20th; Red Willow, 11th, 17th; Crete, 20th.

*Nevada*.—Carson City, 6th, 10th, 11th, 12th, 14th to 20th; 22d to 28th, 30th.

*New Hampshire*.—Antrim, 19th; Mount Washington, 12th to 15th, 18th, 19th, 23d, 27th.

*New Mexico*.—Fort Stanton, 9th.

*New Jersey*.—Somerville, 14th; Readington, 14th, 15th.

*New York*.—Cooperstown, 14th, 21st; North Volney, 14th, 15th, 21st; Palermo, 14th, 19th; Factoryville, 14th, 15th; Ithaca, 14th, 15th, 19th, 26th; Menand Station, 14th, 19th, 20th, 26th; Mountainville, 14th, 15th, 18th, 19th, 21st; Humphrey, 11th, 12th, killing vegetation on latter date; Auburn, 14th; Sycamore, 13th; Rochester, 19th; Oswego, 14th, 19th, 21st; Buffalo, 19th.

*North Carolina*.—Flat Rock, 15th, 16th.

*Ohio*.—North Lewisburg, 14th, 21st; Portsmouth, 17th; Westerville, 19th, 21st; Wauseon, 19th, 21st; Garrettsville, 14th, 21st; New Athens, 19th; Columbus, 21st.

*Oregon*.—Fort Klamath, 1st, 2d, 3d, 10th to 20th, 23d, 24th.

*Pennsylvania*.—Catawissa, 14th, 15th, 21st; Dyberry, 13th, 14th, 15th, 19th, 21st, 22d; Dillingersville, 13th, 14th; Troy, 13th, 14th, 18th, 20th, 29th; Drifton, 14th; Erie, 14th. A light frost occurred at Mount Washington, a suburb of Pittsburgh, on the morning of the 19th.

*Utah*.—Fort Thornburg, 9th, 10th; Salt Lake City, 10th, 16th, 27th.

*Vermont*.—Charlotte, 26th; Newport, 14th; Strafford, 13th, 14th, 19th; Burlington, 14th, 19th, 21st, 23d, 26th; Chester, 14th.

*Virginia*.—Wythville, 13th, 14th. The observer at Lynchburg states that light frost was reported to have occurred on morning of the 15th, in the vicinity of Dublin, Pulaski county.

*Washington Territory*.—Bainbridge Island, 26th; Dayton, 12th, 26th; Spokane Falls, 7th, 8th, 12th, 26th; Fort Spokane, 3d, 8th; Crescent Bay, 30th.

*Wisconsin*.—Embarras, 20th; Lancaster, 18th, 20th, 25th.

*Wyoming*.—Cheyenne, 10th, 11th, 27th, 30th; Fort Bridger, 3d, 10th, 11th, 15th, 16th, 17th, 24th, 30th.

## ICE.

The formation of ice has been reported as follows:

*Dakota*.—Fort Buford, 30th.

*Idaho*.—Boisé City, 25th; the first ice of the season.

*Montana*.—Fort Maginnis, 29th, the first ice of the season; one-quarter of an inch thick.

*Ohio*.—New Athens, 19th; one sixteenth of an inch thick.

## PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada, for September, 1884, as determined by the reports from more than eight hundred stations, is exhibited on chart iii.

The precipitation for the month is largely deficient in the states east of the Mississippi river, except in western Tennessee, the central and lower portions of the Ohio valley, in the vicinity of Atlanta, Georgia, and in portions of the Carolinas, where it is in excess of the average. It is also below the average in the lower part of the Red river valley (the deficiency at Shreveport, Louisiana, amounting to 2.29); in southeastern Dakota, and over the middle and southern slopes. In the table of average precipitation, the mean deficiency for the middle Atlantic states, as determined from comparison of reports for fourteen stations is 3.72; over a large part of this district, the deficiency exceeded 4.00, and in the vicinity of Norfolk, Virginia, and thence southward to Hatteras, North Carolina, it varied from 5.06 at the former station, to 6.97 at the latter. In the south Atlantic states, while the average deficiency (for eleven stations), as shown by the table, is 1.93; the area of deficiency, however, does not include the entire district, but in the vicinities of Augusta, Georgia; Charlotte and Wilmington, North Carolina, and Charleston, South Carolina, the precipitation is in excess of the average; the departure at the last named station is 4.59, and at the other stations named, it varies from from 0.27 to 1.68; In the eastern Gulf states, the average deficiency (for seven stations), is 1.97, the departure varying at the several stations, from 1.27 at New Orleans, Louisiana, to 3.18, at Atlanta, Georgia, while at Vicksburg, Mississippi, an excess of 0.88, is shown. The deficiency in central and eastern Tennessee, amounts to 1.04, at Nashville; 2.09, at Chattanooga, and 2.73, at Knoxville. In the upper lake region, the average precipitation for eleven stations, is about normal, although a deficiency occurs over a large part of the district; at Escanaba, Michigan, the monthly rainfall is 8.77, or an excess of 4.71, as compared with the September average for the last thirteen years. In the lower lake region, the deficiency is general and averages 0.51, for the district. In the middle and southern slopes, the area of deficiency includes all of both districts except southwestern Texas, where an excess occurs.

The precipitation for September is excessive in the following districts; the Valley of the Red river of the North; the lower portions of the Missouri and Arkansas valleys; throughout the Mississippi valley, except in the vicinity of New Orleans; the central and southern portions of the Ohio valley; in the north plateau; northern slope; northern and middle Pacific coast regions; Utah; and the Rio Grande valley. The table shows a slight deficiency for the Missouri valley, while in the northern and southern portions, the precipitation is excessive, being deficient, as before stated, in southeastern Dakota. In the lower portions of the Ohio, Missouri and Ar-



kansas valleys the departures above the average precipitation vary from 2.00 to 4.00.

In the following table are shown for each of the several geographical districts, the average September precipitation for a series of years; the average for September, 1884; and the departures, as deduced from the records of the Signal Service.

Average precipitation for September, 1884.

Districts.	Average for Sept. Signal-Service observations.		Comparison of Sept., 1884, with the average for several years.
	For several years.	For 1884.	
	Inches.	Inches.	Inches.
New England.....	3.59	1.08	2.51 deficiency.
Middle Atlantic states.....	4.24	0.52	3.72 deficiency.
South Atlantic states.....	6.02	4.39	1.63 deficiency.
Florida peninsula.....	6.43	5.40	0.97 deficiency.
Eastern Gulf states.....	4.47	2.50	1.97 deficiency.
Western Gulf states.....	4.24	5.11	0.87 excess.
Rio Grande valley.....	3.76	8.13	4.37 excess.
Tennessee.....	3.38	2.33	1.05 deficiency.
Ohio valley.....	2.54	3.75	1.21 excess.
Lower lake region.....	2.96	2.45	0.51 deficiency.
Upper lake region.....	3.73	3.70	0.03 deficiency.
Extreme northwest.....	2.06	2.70	0.64 excess.
Upper Mississippi valley.....	3.33	5.66	2.33 excess.
Missouri valley.....	2.56	2.50	0.06 deficiency.
Northern slope.....	1.29	1.56	0.27 excess.
Middle slope.....	1.44	0.27	1.17 deficiency.
Southern slope.....	4.02	4.39	0.37 excess.
Southern plateau.....	1.01	1.22	0.21 excess.
Northern plateau.....	0.82	1.74	0.92 excess.
North Pacific coast region.....	1.84	2.89	1.05 excess.
Middle Pacific coast region.....	0.31	0.43	0.12 excess.
South Pacific coast region.....	0.05	0.02	0.03 deficiency.
Mount Washington, N. H.....	9.00	7.58	1.42 deficiency.
Pike's Peak, Colo.....	2.08	0.49	1.59 deficiency.
Salt Lake City, Utah.....	0.74	1.98	1.24 excess.

## DEVIATIONS FROM AVERAGE PRECIPITATION.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average precipitation for September, 1884. Voluntary observers report the following notes in connection with this subject:

**Arkansas.**—Lead Hill, Boone county: monthly precipitation, 5.14, is 1.71 above the September average for the three preceding years.

**Connecticut.**—Hartford: monthly rainfall, 0.79, is 2.51 below the September average.

**Illinois.**—Anna, Union county: monthly precipitation, 3.33, is 0.81 in excess of the September average for the last nine years.

Mattoon, Coles county: monthly precipitation, 4.70, is 2.32 above the September average for the last four years.

Riley, McHenry county: monthly rainfall, 4.34, is 0.44 above the September average for the last twenty-three years.

Sycamore, DeKalb county: monthly precipitation, 3.46, is 0.14 above the September average.

Swanwick, Perry county: monthly precipitation, 2.85, is 0.69 above the September average for the last three years.

Collinsville, Madison county: monthly rainfall, 3.66, is 0.67 above the September average.

**Indiana.**—Wabash, Wabash county: monthly precipitation, 2.39, is 0.22 below the September average for the last nine years.

Vevay, Switzerland county: although the early part of the month was very dry, the rains of the latter part were abundant, amounting to 5.33, or an excess of 1.77 over the September average.

Logansport, Cass county: monthly precipitation, 2.99, is 0.53 below the September average.

**Iowa.**—Professor Gustavus Hinrichs, of Iowa City, director of the state weather service, reports:

The rainfall for September has been of nearly normal frequency, but below the normal in amount.

**Kansas.**—Lawrence, Sumner county: monthly precipitation, 9.15, is 6.07 above the September average, and nearly 3.00 greater than for any September during the last seventeen years. With the exception of the rainfall for June, 1876, that for

September, 1884, is the largest recorded for any month during the above period.

Independence, Montgomery county: monthly precipitation, 9.71, is 6.48 in excess of the September average for the last twelve years, and is the largest September precipitation recorded during that period.

Yates Centre, Woodson county: monthly precipitation, 5.63, is 2.82 above the September average for the last four years.

Wellington, Sumner county: monthly precipitation, 1.10, is 3.00 below the September average for the last six years, and is the smallest September precipitation for that period.

**Maine.**—Gardiner, Kennebec county: monthly precipitation, 2.11, is 1.17 below the September average for a period of forty-eight years.

**Maryland.**—Fallston, Harford county: monthly precipitation, 0.23, is 4.70 below the September average for the last fourteen years, and is the smallest monthly precipitation recorded during that period, with the exception of that for October, 1874, when the amount was exactly the same; the largest September precipitation for that period, 12.95, occurred in 1876.

Table of excessive and greatest monthly precipitation—September, 1884.

Station.	Specially heavy.		Largest monthly.	Amount.	Station.	Specially heavy.		Largest monthly.	Amount.
	Date.	Amt.				Date.	Amt.		
<b>Arkansas.</b>					<b>Minnesota.—Con.</b>				
Fort Smith.....	16, 17	2.30			Northfield.....	8, 9	2.87		
<b>Florida.</b>					Saint Vincent.....	14, 15	2.15		
Fort Barrancas.....	2	5.33	10.75		<b>Mississippi.</b>				
Do.....	5	2.05			Vicksburg.....	3	2.69		
Do.....	6	3.12			<b>Missouri.</b>				
Key West.....	9	2.43	7.08		Dresden.....			13.38	
Jacksonville.....	4, 5	2.42			Boonville.....			10.69	
Pensacola.....	5, 6	2.65			Sedalia.....			10.54	
<b>Georgia.</b>					Springfield.....			10.54	
Augusta.....	10, 11	2.52			Pleasant Hill.....			10.30	
Savannah.....	10	3.16			Harrisonville.....			9.18	
<b>Illinois.</b>					Glasgow.....			8.64	
Griggsville.....	23	2.40	8.11		Mexico.....			8.21	
Do.....	26, 27	2.23			Louisiana.....			7.60	
Rock Island.....	6	1.95	7.59		Pierce City.....	15, 16	4.11	7.30	
Pana.....	21, 22	4.08	7.33		Lexington.....			6.84	
Bunker Hill.....	26, 27, 28	5.83	7.19		Miami.....			6.57	
Springfield.....	26, 27	3.24	6.86		Shelbina.....			6.30	
Greenville.....	28	2.25	6.14		Saint Louis.....	26, 27	2.99	6.04	
Cairo.....	29	2.90			<b>Nebraska.</b>				
Peoria.....	21, 22, 23	4.35			De Soto.....	14	2.30	8.11	
<b>Indiana.</b>					Do.....	23	3.50		
Marengo.....	24	2.00	10.80		<b>New Hampshire.</b>				
Princeton.....	24	2.00	8.20		Mt. Washington.....			7.58	
Richmond.....			6.62		<b>New York.</b>				
Blue Lick.....			6.59		Humphrey.....	28	2.00		
Huntingburg.....	29	2.41	6.27		<b>North Carolina.</b>				
Farmland.....	27	2.40			Wilmington.....	10, 11, 12	9.07	9.34	
Dana.....	7	2.30			New River Int'l.....	11, 12, 13	8.42	8.44	
Spiceland.....	27, 28	2.97			Raleigh.....	12	7.00	7.00	
<b>Indian Territory.</b>					Lumberton.....	10, 11, 12	6.01	6.08	
Fort Reno.....	23, 24	2.49			Charlotte.....	11, 12	6.56		
<b>Iowa.</b>					Smithville.....	12, 13	2.13		
Independence.....	22, 23	7.50	10.90		Fort Macon.....	12, 13	5.51		
Manchester.....	22, 23	3.95	7.25		<b>Ohio.</b>				
Monticello.....	22, 23	3.65	6.80		North Lewisburg.....	27, 28	5.40	7.60	
Logan.....	23	2.70			Eola.....			6.59	
<b>Kansas.</b>					Westerville.....	27, 28	2.83		
Fort Scott.....	26, 26	5.10	11.45		<b>Oregon.</b>				
Do.....	30	2.20			East Portland.....	10	2.00		
Independence.....	30	3.30	9.71		<b>South Carolina.</b>				
Lawrence.....	23	2.00	9.15		Charleston.....	10, 11, 12	8.27	11.03	
Wyandotte.....	22, 23	2.32	7.10		Jacksonborough.....	3	2.00	8.46	
West Leavenworth.....	22, 23	2.10	7.00		Do.....	10	2.00		
Topeka.....	19	2.26	6.88		Statesburg.....	10, 11, 12	6.40	6.67	
Do.....	27	3.98			Florence.....	10, 11, 12	5.41		
Clay Center.....	13	3.52	6.02		Batesburg.....	10, 11	4.28		
Elk Falls.....	15	2.00	6.00		Kirkwood.....	10, 11	4.09		
Manhattan.....	6, 7	2.37			Cheraw.....	10, 11, 12	3.51		
Do.....	28, 27	2.65			Allendale.....	10, 11	2.95		
Yates Center.....	22, 23	2.68			<b>Texas.</b>				
Do.....	27	2.04			Indianola.....	27, 28	6.98	9.60	
Westmoreland.....	6, 7	3.50			Brownsville.....	20	3.02	8.96	
Leavenworth.....	27	2.50			Do.....	27	2.39		
<b>Kentucky.</b>					Fort Brown.....	21	2.70	7.50	
Frankfort.....	4, 5	1.30	6.07		Do.....	27	2.24		
<b>Louisiana.</b>					Rio Grande City.....	10, 11	6.76	7.30	
Alexandria.....	25, 26	2.88			Galveston.....	27, 28	3.89	7.04	
<b>Michigan.</b>					Fort Stockton.....	7, 8	2.64		
Fort Brady.....			7.00		El Paso.....	13	3.03		
Manistiquie.....			6.63		Palestine.....	25	2.25		
Grand Haven.....	23, 24	2.35			Fort Concho.....	10, 11	2.23		
Escanaba.....	23, 24	2.55			<b>Washington Ter.</b>				
Alpena.....	28	2.36			Fort Canby.....	9, 10, 11	2.96	6.28	
<b>Minnesota.</b>					<b>Wisconsin.</b>				
Pierce City.....	15, 16	3.10	7.30		La Crosse.....	6	5.69	10.01	
Chester.....	23	2.66	6.20		Embarras.....	6, 7	2.90	9.40	
Minneapolis.....	8, 9	3.17							

Table of smallest monthly precipitation.—September, 1884.

Station.	Amt.	Station.	Amt.
<i>Alabama.</i>			
Calera.....	0.00	<i>California.—Continued.</i>	
Edwardville.....	0.00	Presidio of San Francisco.....	0.30
Evergreen.....	0.00	San Francisco.....	0.33
Fort Deposit.....	0.00	Santa Cruz.....	0.33
Prattville.....	0.00	Williams.....	0.33
Selma.....	0.00	Niles.....	0.34
Tuscaloosa.....	0.00	Knight's Landing.....	0.35
Weston.....	0.00	Oakland.....	0.35
Jacksonville.....	trace	College City.....	0.36
Birmingham.....	0.10	Emigrant Gap.....	0.51
Newton.....	0.10	Auburn.....	0.56
Eufaula.....	0.14	Colfax.....	0.80
Marion.....	0.20	Chico.....	0.86
Gadsden.....	0.20	<i>Colorado.</i>	
Mount View.....	0.20	West Las Animas.....	0.06
Auburn.....	0.21	Denver.....	0.13
Dadeville.....	0.25	Grand Junction.....	0.18
Withers.....	0.27	Fort Lyon.....	0.20
Decatur.....	0.29	Pueblo.....	0.40
Opelika.....	0.29	Pike's Peak.....	0.49
Union Springs.....	0.30	<i>Connecticut.</i>	
Mount Willing.....	0.35	Southington.....	0.53
Greenville.....	0.50	Hartford.....	0.79
Livingston.....	0.50	<i>Delaware.</i>	
Summersville.....	0.55	Fort Randall.....	0.04
Greensborough.....	0.56	Fort Meade.....	0.23
Montgomery.....	0.58	Yankton.....	0.28
Pineapple.....	0.60	Fort Buford.....	0.53
Scottsborough.....	0.67	Fort Bennett.....	0.68
Florence.....	0.91	Fort Sully.....	0.70
<i>Arizona.</i>			
Casa Grande.....	0.00	<i>District of Columbia.</i>	
Texas Hill.....	0.01	Delaware Breakwater.....	0.99
Wilcox.....	0.14	Washington City.....	0.14
Wickenburg.....	0.23	Distributing Reservoir.....	0.22
Tucson.....	0.30	West Washington.....	0.22
Benson.....	0.30	Receiving Reservoir.....	0.24
Maricopa.....	0.40	<i>Georgia.</i>	
San Simon.....	0.40	La Grange.....	0.00
Fort Bowie.....	0.40	Milledgeville.....	0.00
Fort Carlos.....	0.83	Athens.....	0.01
Fort Thomas.....	0.91	Atlanta.....	0.08
Fort Grant.....	0.98	Newnan.....	0.11
Prescott.....	0.99	Macon.....	0.13
<i>California.</i>			
Anaheim.....	0.00	Bainbridge.....	0.15
Bishop Creek.....	0.00	Union Point.....	0.16
Borden.....	0.00	Rome.....	0.18
Byron.....	0.00	Fort Gaines.....	0.19
Cabazon.....	0.00	Americus.....	0.20
Caliente.....	0.00	Cartersville.....	0.32
Colton.....	0.00	Smithville.....	0.44
Delano.....	0.00	West Point.....	0.60
Fenner.....	0.00	Camak.....	0.64
Freno.....	0.00	Washington.....	0.70
Galt.....	0.00	Albany.....	0.88
Goshute.....	0.00	Gainesville.....	0.95
Hollister.....	0.00	Thomasville.....	0.97
Indio.....	0.00	<i>Kansas.</i>	
Ione.....	0.00	Mauds.....	0.19
Keeler.....	0.00	Dodge City.....	0.23
Kingsburg.....	0.00	Alton.....	0.65
Los Angeles.....	0.00	<i>Louisiana.</i>	
Merced.....	0.00	Point Pleasant.....	0.14
Modesto.....	0.00	Grand Coteau.....	0.75
Mammoth Tank.....	0.00	<i>Maine.</i>	
Needles.....	0.00	Portland.....	0.56
Newhall.....	0.00	<i>Maryland.</i>	
San Fernando.....	0.00	Fort McHenry.....	trace
Soledad.....	0.00	Ocean City.....	trace
Soquel.....	0.00	Baltimore.....	0.09
Summer.....	0.00	McDonough.....	0.18
Tehachapi.....	0.00	Fallston.....	0.23
Tracy.....	0.00	Woodstock.....	0.23
Tulare.....	0.00	Emmitsburg.....	0.82
Antioch.....	trace	Cumberland.....	0.93
Fort Mason.....	trace	<i>Massachusetts.</i>	
Redding.....	0.02	Boston.....	0.31
Monterey.....	0.03	Taunton.....	0.53
Dunnigan.....	0.04	Williamsport.....	0.58
Menlo Park.....	0.04	Milton.....	0.65
Chualar.....	0.07	Thatcher's Island.....	0.77
San Diego.....	0.07	Worcester.....	0.81
Pleasanton.....	0.08	Fall River.....	0.83
San Jose.....	0.08	Somerset.....	0.94
Turlock.....	0.08	Rowe.....	0.95
Farmington.....	0.09	New Bedford.....	0.96
Marysville.....	0.09	<i>Mississippi.</i>	
Lathrop.....	0.10	Holly Springs.....	0.83
Ravenna.....	0.10	<i>Montana.</i>	
Salinas City.....	0.11	Fort Maginnis.....	0.26
Alta.....	0.12	Fort Keogh.....	0.46
Gilroy.....	0.12	Poplar River.....	0.64
Martinez.....	0.13	<i>Nebraska.</i>	
Petaluma.....	0.13	North Platte.....	0.08
Willows.....	0.13	Sargent.....	0.09
Benicia Barracks.....	0.15	Red Willow.....	0.12
San Mateo.....	0.17	Fort Robinson.....	0.50
Pajaro.....	0.18	Beaver Creek.....	0.59
Calistoga.....	0.19	Keene.....	0.80
Orland.....	0.20	Tecumseh.....	0.96
Red Bluff.....	0.20	<i>Nevada.</i>	
Brighton.....	0.23	Boca.....	0.00
Angel Island.....	0.25	Hot Springs.....	0.00
Tennant.....	0.27	Humboldt.....	0.00
Davis.....	0.30	Hawthorne.....	0.00
Livermore.....	0.30	Reno.....	0.00
		Winnemucca.....	0.00
		Wadsworth.....	0.05

Table of smallest monthly precipitation.—September, 1884.—Continued.

Station.	Amt.	Station.	Amt.
<i>Nevada.—Continued.</i>			
Brown.....	0.06	<i>Pennsylvania.</i>	
Carson City.....	0.22	Dillingerville.....	trace
Otego.....	0.42	Germantown.....	0.14
Wells.....	0.45	Haverford College.....	0.20
Goconda.....	0.57	Philadelphia.....	0.20
Carlin.....	0.74	Fallington.....	0.22
Beowawe.....	0.93	West Chester.....	0.42
<i>New Hampshire.</i>			
Bristol.....	0.52	Troy.....	0.77
Belmont.....	0.72	Chambersburg.....	0.99
Lake Village.....	0.83	<i>Rhode Island.</i>	
Wiers Bridge.....	0.95	Block Island.....	0.62
<i>New Jersey.</i>			
Sandy Hook.....	0.03	<i>South Carolina.</i>	
Little Egg Harbor.....	0.09	Greenville.....	0.00
South Orange.....	0.15	Anderson.....	0.06
Moorestown.....	0.16	Spartanburg.....	0.75
Somersville.....	0.26	<i>Tennessee.</i>	
Cape May.....	0.31	Greenville.....	trace
Atlantic City.....	0.34	Howell.....	0.16
Phillipsburg.....	0.40	Andersonville.....	0.42
Viola.....	0.40	Fosteria.....	0.42
Paterson.....	0.47	Rutledge.....	0.50
Salem City.....	0.58	Savannah.....	0.59
<i>New Mexico.</i>			
Fort Wingate.....	0.76	Ashwood.....	0.61
Deming.....	0.80	Hurricane Switch.....	0.63
<i>New York.</i>			
New York City.....	0.15	Knoxville.....	0.66
Fort Columbus.....	0.22	Beach Grove.....	0.80
David's Island.....	0.33	Flat Creek.....	0.82
Fort Hamilton.....	0.46	Careyville.....	0.92
Fort Niagara.....	0.70	<i>Texas.</i>	
Mountainville.....	0.98	Fort Elliott.....	0.84
<i>North Carolina.</i>			
Wash Woods.....	0.05	Cleburne.....	1.00
Weldon.....	0.08	<i>Utah.</i>	
Kitty Hawk.....	0.15	Fort Thornburg.....	0.68
Linsbinton.....	0.17	<i>Vermont.</i>	
Salisbury.....	0.20	Stratford.....	0.70
Statesville.....	0.20	Dorset.....	0.85
Lenoir.....	0.30	<i>Virginia.</i>	
Brevard.....	0.70	Accotink.....	trace
<i>Ohio.</i>			
Junction.....	0.68	Johnsontown.....	trace
<i>Oregon.</i>			
Linkville.....	0.58	Marion.....	0.03
Fort Klamath.....	0.88	Variety Mills.....	0.04
		Fort Monroe.....	0.16
		Grief.....	0.17
		Norfolk.....	0.33
		Chincoteague.....	0.42
		Cape Henry.....	0.43
		Fort Myer.....	1.00
		Blacksburg.....	1.00
		<i>Washington Territory.</i>	
		Ainsworth.....	0.67

**Massachusetts.**—Worcester, Worcester county: monthly precipitation, 0.82, is 2.56 below the September average for the last forty-six years. The largest September precipitation for that period, 10.01, occurred in 1882; the smallest, 0.20, occurred in 1855; in 1865 and 1877 the rainfall for September was 0.68 and 0.44, respectively.

**Missouri.**—Saint Louis: monthly precipitation, 6.06, is 3.06 in excess of the September average for a period of many years. The largest September rainfall recorded during the period is 10.53 for 1866.

**New Hampshire.**—Antrim, Hillsborough county: monthly precipitation, 2.70, is 0.77 below the September average for the last twelve years.

**New Jersey.**—South Orange, Essex county: monthly precipitation, 0.15, is, with the exception of 0.12 for August, 1881, the smallest recorded in any month during the last fifteen years.

**Moorestown, Burlington county:** monthly precipitation, 0.16, is 3.56 below the September average for a series of years.

**New York.**—Palermo, Oswego county: monthly precipitation, 1.90, is 1.20 below the September average for the last thirty-one years.

**North Volney, Oswego county:** monthly precipitation, 2.20, is 0.63 below the September average for the last thirteen years.

**Ohio.**—Wauseon, Fulton county: monthly precipitation, 1.85, is 0.60 below the September average for the last twelve years.

**Pennsylvania.**—Dyberry, Wayne county: monthly precipitation, 2.53, is 0.03 above the September average for the last fourteen years.

**Tennessee.**—Austin, Wilson county: monthly precipitation, 1.51, is the smallest recorded in September during the last fifteen years.

**Texas.**—New Ulm, Austin county: monthly precipitation, 5.18, is 0.69 below the September average for a period of thirteen years.

**Virginia.**—Wytheville, Wythe county: monthly precipitation,



tion, 1.74, is 1.93 below the September average for a period of twenty-one years; in only three years of the record has the September precipitation been smaller.

Variety Mills, Nelson county: monthly precipitation, 0.04, is 3.38 below the September average for the last six years. In no month during the last ten years has the rainfall been as small as that for September, 1884.

West Virginia.—Helvetia, Randolph county: monthly precipitation, 0.92, is 3.40 below the September average for the last eight years. The smallest September precipitation previously recorded is 1.37 for 1881.

#### HAIL.

Hail is reported to have fallen in the various states and territories as follows:

Arkansas.—Lead Hill, 19th.  
California.—Sacramento, 30th; Cape Mendocino, 29th.  
Colorado.—Pike's Peak, 23d.  
Dakota.—Webster, 26th.  
Illinois.—Swanwick, 22d; Bunker Hill, 16th.  
Indiana.—Vevay, 27th; Greencastle, 23d.  
Iowa.—Independence, 22d; Cresco, 23d; Manchester, 10th; Dubuque, 23d; Keokuk, 22d; Des Moines, 9th.  
Kansas.—Westmoreland, 27th; Independence, 19th; Manhattan, 6th; Allison, 4th.  
Kentucky.—Frankfort, 9th.  
Nebraska.—Genoa, 18th; Omaha, 26th.  
Nevada.—Fort McDermit, 9th.  
New Hampshire.—Mount Washington, 20th.  
New York.—Le Roy, 2d; Menand Station (near Albany), 20th.  
North Carolina.—Flat Rock, 22d.  
Pennsylvania.—Erie: a severe hail-storm occurred between 5.30 and 6.30 p. m. on the 20th. The hail-stones were generally small, the largest being the size of hickory nuts. The storm passed off over the lake. No hail fell at points ten miles south and five miles east of Erie; hail fell at Catawissa on the 28th.  
Texas.—Fort Concho, 10th.  
Utah.—Salt Lake City, 14th.  
Virginia.—Wytheville, 9th.  
Washington Territory.—Pysht, 14th.  
Wisconsin.—Sussex, 10th; Madison, 10th; Milwaukee, 10th; La Crosse, 21st.  
Wyoming.—Fort Bridger, 8th.

#### SNOW.

Snow fell during September, as follows:

California.—Red Bluff: the mountains north and east of this place were covered with snow on the morning of the 9th.

Colorado.—On the summit of Pike's Peak, snow fell on the 1st, 22d, 23d, 26th, and 27th.

Georgetown, 26th: the first snow of the season fell here on this date.

Denver: a fierce snow storm occurred on Long's Peak during the evening of the 23d. A heavy snow storm prevailed in the mountains of western Colorado on the 26th.

Dakota.—Deadwood: light rain, with occasional sleet and light snow, fell from 10 a. m. to 8 p. m. on the 29th.

Montana.—Fort Maginnis: light snow began falling during the night of the 5-6th, and ended at 7 a. m. of the 6th; on the 7th light snow fell from 11 a. m. to 1 p. m., and again during the night of the 8th.

Fort Assinaboine: snow was observed on the mountains, about thirty miles north of this station, on the 7th; the Sweet Grass mountains, eighty-five miles north, were also covered.

Fort Ellis, 3d to 7th, 28th.

New Hampshire.—On the summit of Mount Washington: light snow fell from 5.58 to 6.50 p. m. on the 20th.

Nova Scotia.—Halifax, 15th: it is reported that five inches of snow fell at Spring Hill, Cumberland county, on the 14th; at Truro, snow fell to a depth of two inches.

Oregon.—East Portland: large flakes of snow fell between 2.45 and 3 a. m. on the 29th. At Lake View snow fell on the 6th and 30th.

Utah.—Salt Lake City: snow fell on the mountains surrounding this place on the 7th. Reports from Bute state that snow fell to a depth of six inches at that place on the 6th.

Wyoming.—Fort Bridger, 8th, 9th and 26th.

#### MONTHLY SNOW-FALLS.

[Expressed in inches and tenths.]

The following monthly snow-falls have been reported.

California.—Cisco, 14.0; Summit, 11.0.

Colorado.—On the summit of Pike's Peak, 4.3; traces remaining on the ground at the end of the month.

Nevada.—Otego, 6.0; Toano, 4.0; Wells, 2.5.

#### SLEET.

Pike's Peak, Colorado, 3d, 4th.

Deadwood, Dakota, 29th.

Fort Ellis, Montana, 25th.

Mount Washington, New Hampshire, 20th.

Table of rainy and cloudy days, relative humidity, and dew-point for Sept., 1884

Districts.	Rainy days.			Cloudy days.			Rel. humidity. °			Dew-point.		
	From	5 to	12	From	2 to	6	Percentages.			From	0	0
New England.....	2	9	12	2	4	6	62.8	80.1	83.5	49.3	59.9	59.9
Middle Atlantic states.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
South Atlantic states.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Florida peninsula.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
East Gulf states.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
West Gulf states.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Rio Grande valley.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Tennessee.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Ohio valley.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Lower lake region.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Upper lake region.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Extreme northwest.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Upper Mississippi valley.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Missouri valley.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Northern slope.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Middle slope.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Southern slope.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Southern plateau.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Northern plateau.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
North Pacific coast region.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Middle Pacific coast region.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
South Pacific coast region.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Mt. Washington, N. H.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Pike's Peak, Colo.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
Salt Lake City, Utah.....	3	17	17	0	4	4	61.1	83.2	83.2	56.8	65.0	65.0
	Seventeen	Four	Six	None	One	Four	74.5	74.7	74.7	55.1	56.1	56.1
							94.9			40.0		
							70.0			23.7		
							44.6			34.7		

\* Relative humidity corrected for altitude.

#### COTTON REGION REPORTS.

In the table below are given the average precipitation and the means of the maximum and minimum temperatures for September, 1884, with the September averages for the two preceding years, in the several cotton growing districts. The reports from the district of Galveston are missing. In the districts of New Orleans, Charleston, Memphis, Vicksburg, and Little Rock, the precipitation was excessive and in the remaining districts it was deficient. The temperature was generally higher than the mean for the two preceding years in all of the districts.

Temperature and rainfall data for the cotton districts, September.

Districts.	Rainfall.			Temperature.								Extremes for Sept., 1884.	
	Average for Sept. of two preceding years.	Average for Sept., 1884.	Departures.	Maximum.				Minimum.					
				Mean for Sept. of two preceding years.	Mean for Sept., 1884.	Departures.	Mean for Sept. of two preceding years.	Mean for Sept., 1884.	Departures.				
										Max.	Min.		
New Orleans.....	1.93	2.67	+ 0.74	87.6	90.6	+ 3.0	64.0	69.3	+ 5.3	99	53		
Savannah.....	3.52	2.34	- 1.18	86.8	88.4	+ 1.6	66.4	65.7	- 0.7	98	42		
Charleston.....	4.06	6.54	+ 2.48	84.6	85.6	+ 1.0	63.0	66.0	+ 3.0	93	54		
Atlanta.....	2.44	0.52	- 1.92	82.8	87.6	+ 4.8	61.7	63.7	+ 2.0	98	44		
Wilmington.....	6.42	3.32	- 3.10	80.7	85.8	+ 5.1	62.0	62.1	+ 0.1	99	43		
Memphis.....	1.37	2.06	+ 0.69	84.0	88.1	+ 4.1	58.3	64.3	+ 6.0	100	45		
Galveston.....	3.04			87.8			65.0						
Vicksburg.....	1.42	2.56	+ 1.14	87.0	91.0	+ 4.0	61.4	67.4	+ 6.0	98	55		
Montgomery.....	1.95	0.22	- 1.73	85.4	90.0	+ 4.6	61.4	66.0	+ 4.6	108	45		
Augusta.....	2.88	2.33	- 0.55	84.4	87.6	+ 3.2	64.0	64.0	normal	102	44		
Little Rock.....	1.48	2.90	+ 1.42	85.5	88.5	+ 3.0	56.2	63.0	+ 6.8	99	29		
Mobile.....	1.02	0.45	- 0.57	88.8	90.4	+ 1.6	62.8	66.0	+ 3.2	98	51		

## WINDS.

The most frequent directions of the wind during September, 1884, are shown on chart ii. by arrows flying with the wind.

In the lake region, New England, middle Atlantic and west Gulf states, southern slope, and in the Ohio, upper Mississippi and Missouri valleys, the prevailing winds were from southeast to southwest; in the south Atlantic and east Gulf states, they were from northeast to southeast; in the extreme northwest and northern slope, they were from southwest to northwest; on the California coast, they were westerly, except at Cape Mendocino, where they were from the north; in the plateau regions and on the north Pacific coast they were variable.

## TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Block Island, R. I.....	8,668	New Haven, Conn.....	4,047
Middle Atlantic states.....	Del. Breakwater, Del.....	10,697	Lynchburg, Va.....	1,860
South Atlantic states.....	Fort Macon, N. C.....	9,530	Augusta, Ga.....	2,861
Florida peninsula.....	Key West.....	6,337	Cedar Keys.....	6,281
Eastern Gulf states.....	New Orleans, La.....	4,570	Montgomery, Ala.....	3,130
Western Gulf states.....	Galveston, Tex.....	6,419	Little Rock, Ark.....	1,678
Rio Grande valley.....	Brownsville, Tex.....	4,822	Rio Grande City, Tex.....	4,580
Tennessee.....	Memphis.....	3,345	Chattanooga.....	2,675
Ohio valley.....	Louisville, Ky.....	4,152	Cincinnati, Ohio.....	3,210
Lower lake region.....	Sandusky, Ohio.....	8,167	Toledo, Ohio.....	5,731
Upper lake region.....	Grand Haven, Mich.....	7,930	Chicago, Ill.....	5,800
Extreme northwest.....	Fort Totten, Dakota.....	8,445	Bismarck, Dak.....	6,187
Upper Mississippi valley.....	Saint Louis, Mo.....	8,174	Dubuque, Iowa.....	3,750
Missouri valley.....	Huron, Dak.....	7,921	Leavenworth, Kans.....	5,586
Northern slope.....	Cheyenne, Wyo.....	8,596	Deerwood, Dak.....	2,532
Middle slope.....	Dodge City, Kan.....	11,296	Denver, Colo.....	4,544
Southern slope.....	Fort Concho, Tex.....	5,876	Fort Davis, Tex.....	3,362
Southern plateau.....	Prescott, Ariz.....	4,774	El Paso, Tex.....	1,556
Middle Plateau.....	Salt Lake City, Utah.....	3,844	Lewiston, Idaho.....	1,706
Northern plateau.....	Dayton, Wash. T.....	4,170	Olympia, Wash. T.....	1,641
North Pacific coast region.....	Fort Canby, Wash. T.....	6,767	Red Bluff, Cal.....	4,521
Middle Pacific coast region.....	Cape Mendocino, Cal.....	13,419	Los Angeles, Cal.....	3,583
South Pacific coast region.....	San Diego, Cal.....	4,195		

The total movements of the air on the summits of Mount Washington, New Hampshire, and Pike's Peak, Colorado, were 29,335 and 16,517 miles, respectively.

## HIGH WINDS.

On the summit of Mount Washington, New Hampshire, maximum velocities of fifty miles or more per hour occurred as follows: 70, nw., 1st; 70, nw., 2d; 60, w., 3d; 78, w., 4th; 88, nw., 5th; 84, nw., 6th; 56, nw., 7th; 68, nw., 8th; 76, nw., 10th; 92, w., 11th; 91, w., 12th; 56, nw., 13th; 64, nw., 14th; 56, w., 15th; 90, w., 16th; 84, w., 17th; 50, nw., 18th; 96, nw., 20th; 93, nw., 21st; 64, w., 22d; 68, sw., 24th; 66, nw., 25th; 57, nw., 26th; 72, s., 27th; 70, w., 28th; 90, w., 29th; 70, w., 30th.

The following high velocities were reported from Pike's Peak, Colorado: 56, w., 2d; 60, w., 3d; 52, w., 6th; 52, w., 6th; 52, w., 20th; 52, w., 23d; 56, sw., 26th; 52, nw., 27th; 64, nw., 29th.

Other stations reporting velocities of fifty miles or more per hour are as follows:

Cape Mendocino, California, 62, se., 20th.  
Fort Totten, Dakota, 51, w., 3d.  
Delaware Breakwater, Delaware, 58, ne., 14th.  
Fort Assinaboine, Montana, 50, nw., 3d.  
Kitty Hawk, North Carolina, 50, ne., 13th.

## LOCAL STORMS AND TORNADOES.

**Colorado.**—Denver: between 3 p. m. of the 7th and 2.05 a. m. of the 8th high winds prevailed at this place. At 7 p. m. a maximum velocity of forty-eight miles per hour from the south was recorded; numerous trees in this city were blown down.

**Dakota.**—Huron: a tornado cloud was observed at a considerable distance northwest of this station at about daylight of the 1st; it moved southward and gradually disappeared, apparently not touching the ground. Reports from the Wessington

hills, about twenty-five miles southwest of Huron, state that several tornado clouds were observed to the southwest of that place at about the same time the tornado cloud was observed at Huron.

**Meckling, Clay county:** a tornado occurred at 5 p. m. on the 9th; and moved in a direction 45° east of north. Its path was twenty-five miles in length, and its width one hundred and sixty-five feet. The progressive movement of the tornado cloud was eighteen miles per hour. Some live-stock was killed and several buildings were destroyed. The damage to property is estimated at \$10,000.

**Illinois.**—Greenville, Bond county: a violent storm of wind, rain, and hail, causing a large amount of damage, occurred in this vicinity at about 11.40 p. m. on the 16th. In the town, trees and fences were blown down, and at the Vandalia railroad depot several cars were blown from the side track on to the main track. At points south and east the storm was much more severe, and caused great damage to the corn crop. Hail stones fell to depths of several inches, and in some places they remained on the ground eighteen hours after the storm.

**Bunker Hill, Macoupin county:** at 10.30 p. m., on the 16th, a destructive hail-storm passed four miles south of this station; considerable damage was done by lightning at this place.

**Iowa.**—Humboldt, Humboldt county: a severe thunder-storm occurred about ten miles west of station at about 9 p. m. of the 8th. Much damage was caused by wind and lightning.

**Sioux City, Woodbury county:** this city and vicinity were visited by a violent storm of rain, hail and wind on the 8th. Several barns were unroofed and other out-buildings were damaged. Reports from Boulinet, O'Brien county, state that several buildings at that place were demolished by the storm. On the evening of the 9th, a tornado occurred in the Perry valley, twelve miles north of Sioux City. Its path was short and its width two hundred and fifty feet. Several buildings were destroyed. The course of the tornado was east 65° north.

**Burlington:** a severe storm occurred at about 7.45 p. m. on the 15th; the heavy rainfall flooded the streets and the wind blew down signs, etc., and caused other damage.

**Dubuque:** during a storm on the morning of the 23d, the wind attained a velocity of twenty-six miles per hour, causing no damage other than blowing down a few fences and signs. West of this place the storm was very destructive and was accompanied by very large hail. The Illinois Central Railroad track was badly washed, causing delay of trains.

**Des Moines:** storms of considerable severity prevailed in various parts of the state during the night of the 26th-27th. At Wall Lake, Sac county, buildings were unroofed by the high wind; slight damage was done at Odebolt, in the same county. In some places the storm was accompanied by hail.

**Kansas.**—Mr. J. W. Gregory, voluntary observer at Sherlock, Finney county, furnishes the following report of a destructive storm which prevailed at that place on the 8th, 9th, and 10th of August. Through an oversight this report was not published in the August REVIEW:

On the 8th a slight and unexpected shower from the southeast began at 3.36 p. m. and continued for fifteen minutes; an interval of one-half hour followed, and it again began to rain; another brief cessation occurred at about 4.45 p. m., after which rain set in and continued until 6 p. m. of the 10th. The rain was steady and quite heavy until the evening of the 9th, when it became light, but there were occasional heavy showers during the following night. The rain on the 10th was a succession of brisk showers and heavy and light mists. During the storm the wind blew steadily from the southeast, with the exception of one hour—from 2.30 to 3.30 p. m. on the 10th. No thunder or lightning accompanied the storm. The total amount of rainfall was 5.34 inches. The destructive nature of the storm was not realized until after it had ended. Herds of cattle and sheep were driven before the storm in spite of the efforts of the herdsmen to keep them back. In some instances sheep were driven for a distance of fifty miles, large numbers dying on the way; a few cattle and horses also perished. Although this storm continued for nearly three days, it seems to have been of a local character, no reports of it having been received from other points.

**Massachusetts.**—Malden, Middlesex county: a very severe thunder storm accompanied by high wind, occurred at 5.10



p. m. of the 11th. A large number of shade and fruit trees were blown down; many buildings at this place and in neighboring localities were struck by lightning.

**Michigan.**—Alpena: a thunder storm, accompanied by heavy rain, passed over this place from the west on the afternoon of the 10th; the wind attained a velocity of forty-eight miles per hour at 1.26 p. m. Considerable damage was done in this vicinity.

**Minnesota.**—Saint Paul: from 3.15 to 3.25 p. m. on the 8th, the wind blew at the rate of twenty-eight miles per hour. In the lowlands about one mile south of station, on the opposite side of the river, some temporary buildings and a number of chimneys were blown down.

Owatonna, Steele county: between 7 and 8 p. m. of the 8th a violent storm prevailed at this place.

Stillwater, Washington county: reports from Marine, in this county, state that from fifteen to twenty houses were wrecked by the storm on the evening of the 9th. A number of persons were injured. A large barn at Grant, in this county, was blown down. But little damage was done at Stillwater.

White Bear Lake, Ramsey county: at about 5 p. m. of the 9th, a tornado occurred at this place. The cloud was of the usual funnel shape, and of greenish color. The sheds of the Saint Paul and Duluth railroad company were demolished, and hundreds of trees were blown across the railroad between White Bear Station and Dellwood. This tornado began about one and one half miles north of Minneapolis, and extended to Price county, Wisconsin, passing through the following places: White Bear Lake and Marine, Minnesota; Star Prairie, Clear Lake, Clayton and Turtle Lake, Wisconsin. It began at 5 p. m., and moved east, 30° north. The length of path was one hundred and thirty miles, and its width 2,640 feet. The progressive movement of the tornado cloud was fifty miles per hour, and the shortest time in passing any one point was two minutes. The storm was very destructive to both life and property. Six persons were killed, and seventy-five wounded. Three hundred buildings were destroyed, and much live stock killed. The total valuation of property destroyed is estimated at \$4,000,000.

**Mississippi.**—Canton, Madison county: a destructive storm of wind and rain occurred on the evening of the 28th. Trees and fences were blown down, and considerable damage done to the cotton crop.

**Missouri.**—Grant City, Worth county: the most severe rain and wind storm of the season occurred at about 1 a. m. on the 19th. Fences were blown down and much damage was done to the stacked grain and hay and to the standing corn. Considerable hail fell in the western part of the county.

Columbia, Boone county: a tornado occurred at 5.30 p. m. on the 23d. It moved northeastward, the path being about three hundred feet wide. Several buildings were demolished.

**New Jersey.**—Sandy Hook: during a gale on the 16th the schooner "James Wentworth" grounded on Middle Ground Shoals, and the sloop-yacht "Lettie" dragged anchor in the bay.

**New York.**—Rochester: a violent thunder storm, accompanied by a light fall of rain, occurred during the afternoon and evening of the 10th. The electrical discharges were frequent and intense. In the southern part of the city the rainfall was much heavier than in the vicinity of the Signal office. At Geneva, Ontario county, the streets were flooded by the heavy rainfall. Near Moscow, in Livingston county, hail fell to a depth of two inches. A tank containing 30,000 barrels of oil at Orleans, Ontario county, was struck by lightning, resulting in a loss estimated at from \$30,000 to \$40,000. At Lima, Livingston county, and Pittsfield, Otsego county, the storm was also severe, while at a short distance north of Rochester no rain fell.

Wellsville, Allegheny county: the village of Shongo, in the valley of the Genesee river, and about eight miles south of Wellsville, was almost completely destroyed by a tornado about 6.20 p. m. of the 28th. Twenty-six buildings, some of

which were the most substantial structures of the place, were demolished; two persons were killed and about twenty were injured. The storm came from the west or southwest, and passed eastward. Its track was from forty to fifty rods wide and its duration very short. For a distance of one-half mile northwest of Shongo, the fields were strewn with household effects and various kinds of debris.

Elmira, Chemung county: a violent storm passed over the village of Wellsbury, about six miles east of this place, on the afternoon of the 28th. Dwellings, barns, and other outbuildings were unroofed and many fruit and shade trees were blown down. The storm was accompanied by a heavy rainfall which flooded the streets.

Savona, Steuben county: at about 7.30 p. m. of the 28th, a violent storm visited this section, blowing down buildings, fences, and trees. The storm first began its destruction at the village of Thurston, about six miles south of Savona, and moved northeastward, destroying buildings throughout its course.

Buffalo: a severe gale from the southwest began at 4.47 p. m. of the 28th, and continued until 1.17 a. m. of the 29th; a maximum velocity of forty-four miles was attained at 8.12 p. m.

**Ohio.**—Toledo: on the 24th, a high wind, blowing in gusts, prevailed from 7.06 a. m., until 2.30 p. m., a maximum velocity of thirty-eight miles per hour, from the south, being recorded at 9.54 a. m. In the surrounding country fences were blown down and the apple crop was badly damaged. Captains of vessels report that the storm on Lake Erie was the severest of the season. The steamer "Chief Justice Waite," bound for Put-in-Bay, was compelled to return to this port; and the propeller "Moseley" was driven against the schooner "E. R. Williams" and slightly damaged.

Columbus: on the 28th, a storm from the west set in at 12.56 p. m., and continued until 2.11 p. m. Very heavy rain fell, and the wind reached a velocity of thirty miles per hour. Considerable damage was done in the city and vicinity.

Winchester, Adams county: a severe storm of wind and rain occurred on the evening of the 28th; trees were blown down and other damage done.

Springfield, Clarke county: a severe storm of rain and hail occurred on the afternoon of the 28th; it lasted for three-quarters of an hour, the rainfall being the heaviest of the season. Considerable damage was done by the high wind and the heavy rainfall.

Dayton, Montgomery county: a wind and rain storm of unusual violence occurred about twenty-five miles north of this place on the 28th. The rain fell in torrents, causing the Miami river to rise five feet at Dayton, in a very short time. At Swift Run, two miles north of Piqua, in Miami county, the banks of the lakes connecting with the Piqua water supply, gave away, flooding the Miami river and Erie canal and causing a break in the latter. Four houses at Saint Paris, Champaign county, were damaged by lightning, and north of Mechanicsburg in the same county, houses and barns were blown down. At Dayton heavy rain fell for about one hour, flooding the lower part of the city.

Garrettsville, Portage county: a high wind prevailed at 3 p. m. on the 28th; no damage was done at this place, but at Freedom, five miles north, several houses were unroofed and fencing, trees, etc., were blown down.

**Pennsylvania.**—Bradford, McKean county: a tornado passed near Alton, in this county, at about 5 p. m. on the 28th. It passed near Riterville, but caused no damage at that place; thence it pursued a southwesterly course, striking the village of Alton, fifteen miles south of Bradford, its path being strewn with large trees. In Alton seven buildings were completely wrecked, and a bridge near that place was carried a distance of five rods. Along the Erie railroad, between Riterville and Big Shanty, trees were blown across the track and the telegraph lines were prostrated. The storm in this vicinity was of not more than three minutes' duration.

Wellsborough, Tioga county: the storm on the 28th was very severe at points twenty-five miles north of station, where trees and fences were blown down and buildings demolished.

*Province of Quebec.*—Quebec: a severe storm occurred during the night of the 17-18th; houses were blown down, trees uprooted, and other damage done.

*Texas.*—Fort Stockton: a thunder storm prevailed at this place from 11 a. m. to 4.20 p. m. on the 4th. Fifteen miles south, hail fell for forty-five minutes, the hailstones being as large as walnuts. The storm moved from southwest to north-east.

Rio Grande City: heavy rain began at 12.05 a. m. on the 10th and continued until noon, the total rainfall being 5.64 inches.

Indianola: a heavy rain and thunder storm occurred during the morning of the 28th. The rainfall for the thirteen hours ending at 10.40 a. m., was 5.08 inches. The lowlands in this vicinity were completely inundated.

*Utah.*—Nephi, Juab county: a destructive storm of rain and hail occurred at Circle Valley, Beaver county, on the 2d.

*Virginia.*—Lynchburg: a heavy rain storm occurred on the afternoon of the 11th; the rainfall was 1.22 inches, nearly all of which fell in forty minutes.

*Wisconsin.*—La Crosse: a very heavy rain storm occurred during the afternoon and evening of the 6th. From 5.07 to 11.35 p. m. 5.41 inches of rain fell, and 5.00 inches of this amount fell in less than three hours. The total rainfall for the day was 5.69 inches, which is the largest daily rainfall that has occurred since this station was established, in November, 1872. From 7.30 to 9.90 p. m. there was a continuous display of lightning and many buildings were struck. The heavy rainfall flooded the streets and cellars, causing a large amount of damage; several extensive washouts occurred on the railroads, resulting in delay of trains.

Clear Lake, Polk county: a tornado occurred at this place late in the afternoon of the 9th, leaving the greater part of the town in ruins and killing three persons. The damage caused by the storms is estimated at about \$150,000, about forty buildings in Clear Lake and vicinity having been destroyed.

At Clayton, about eight miles northeast of Clear Lake, about one-half of the lighter buildings of the village were destroyed. The storm struck Clayton about 6 p. m.

Eau Claire, Eau Claire county: a severe wind and rain storm passed over this town, from the northwest at 4.35 p. m. on the 9th, causing great damage to the grain and hay stacks.

Chippewa Falls, Chippewa county: the severest storm of season occurred during the night of the 9-10th. The heavy rainfall caused the Chippewa river to rise rapidly.

#### NAVIGATION.

##### FLOODS.

Eau Claire, Eau Claire county, Wisconsin: both the Chippewa and Eau Claire rivers began falling at about noon on the 11th, after having reached the unprecedented height of twenty-six feet above low-water mark. All of the bridges over the Chippewa river, ten in number, were washed away. It is estimated that the damage in the vicinity of Chippewa Falls and Eau Claire will reach \$1,500,000. Business houses on either side of both rivers were submerged. In Eau Claire nearly four hundred houses were either swept away or wrecked, and 2,000 persons were rendered dependent for shelter upon those living in the higher localities. At 9 p. m. of the 11th, the Chippewa river had fallen three feet below its maximum height, which was four feet and seven inches above the flood of 1880; and by the morning of the 12th it had fallen more than six feet.

Wausau, Marathon county, Wisconsin: the heavy rains preceding the 11th, caused a destructive flood in the Wisconsin river. On the above date the water reached a point within a few inches of the high water-mark of September 25, 1880. All of the lumber mills along the river were compelled to suspend

work, and a large quantity of lumber was under water. At Wausau the water covered the Chicago, Milwaukee, and Saint Paul railway switch, and the bridges near the Michigan Lumber Company's mill were secured by cables to prevent them from being washed away. The bridges in the vicinity of Merrill, Lincoln county, were washed away and all the tributaries to the Wisconsin river in the county were much swollen. With the exception of the Comstock Mills, all of the mills at Merrill were compelled to shut down on account of high water.

La Crosse, Wisconsin: the very heavy rains about the 6th of the month caused great damage in this state. Large quantities of heavy drift-wood, lumber, and broken rafts passed this place from the 14th to 25th. The Mississippi river rose from three feet and three inches on the 3d to eleven feet and ten inches on the 16th. This is the most rapid rise shown by the river record of this station. On the 16th the water reached the tops of the levees.

Rio Grande City, Texas: the very heavy rainfall of the 10th caused the Rio Grande river to rise rapidly on that date; it reached its maximum height, eighteen feet above low-water mark, at 1 p. m. The banks of the river were washed away and the low lands south of this place were flooded.

#### STAGE OF WATER IN RIVERS.

In the following table are shown the danger points at the various river stations, the highest and lowest stages for September, 1884, with the dates of occurrence and the monthly ranges:

*Heights of rivers above low-water mark, September, 1884.*

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>	<i>Fl. In.</i>		<i>Fl. In.</i>		<i>Fl. In.</i>	
Shreveport, Louisiana.....	29 9	1	1 5	24	0 2	1 7
<i>Arkansas:</i>						
Little Rock, Arkansas.....	33 0	6	6 7	16, 17	3 6	3 1
Fort Smith, Arkansas.....		2	* 0 3	10	* 4 4	4 1
<i>Missouri:</i>						
Yankton, Dakota.....	20 0	1	15 9	30	10 9	5 0
Omaha, Nebraska.....	16 0	10, 11, 14	7 8	9	7 1	0 7
		15, 16				
Leavenworth, Kansas.....	21 0	1	10 4	25	7 9	2 7
<i>Mississippi:</i>						
Saint Paul, Minnesota.....	14 6	12	4 10	4, 7	3 1	1 9
La Crosse, Wisconsin.....	18 0	16, 17	10 2	1	2 1	8 1
Dubuque, Iowa.....	21 10	24, 25	14 6	1, 2	3 10	10 8
Davenport, Iowa.....	15 0	28	11 4	2	2 6	8 10
Keokuk, Iowa.....	14 0	28	10 4	5, 6	2 9	7 7
Saint Louis, Missouri.....	30 0	30	20 6	15	9 2	11 4
Cairo, Illinois.....	40 0	30	14 3	23	7 1	7 2
Memphis, Tennessee.....	34 0	7	8 4	22, 26	3 4	5 0
Vicksburg, Mississippi.....	41 0	11, 12	9 9	30	5 1	4 8
New Orleans, Louisiana.....	-2 6	5, 6, 7	-12 1	19	-12 11	0 10
<i>Ohio:</i>						
Pittsburg, Pennsylvania.....	20 0	19	4 1	11, 12	0 5	3 8
Cincinnati, Ohio.....	50 0	1	4 5	27	2 6	1 11
Louisville, Kentucky.....	24 0	1	3 5	24	2 7	0 10
<i>Cumberland:</i>						
Nashville, Tennessee.....	42 0	4	3 8	30	0 6	3 2
<i>Tennessee:</i>						
Chattanooga, Tennessee.....	33 0	1	3 2	28, 29, 30	0 7	2 7
<i>Monongahela:</i>						
Pittsburg, Pennsylvania.....	29 0	19	4 1	11, 12	0 5	3 8
<i>Saragaha:</i>						
Augusta, Georgia.....		12	6 7	25, 26, 29	4 6	2 1
<i>Willamette:</i>						
Portland, Oregon.....		11	5 5	30	0 6	4 11
<i>Sacramento:</i>						
Red Bluff, California.....		9, 10	0 11	1 to 8	0 10	0 1
		14 to 24		11 to 13		
<i>Mobile:</i>						
Sacramento, California.....		13, 14	8 9	25 to 30	7 9	1 0
<i>Colorado:</i>						
Mobile, Alabama.....		6	18 1	12	15 10	2 3
Yuma, Arizona.....						

\* Below bench mark.

† Below high-water mark of 1874 and 1883.

The Cumberland river at Nashville, Tennessee, was not navigable at any time during the month.

At Saint Paul, Minnesota, the Mississippi river reached a height sufficient to admit of the passage of large steamers on the 2d.

The Ohio river at Vevay, Indiana, was navigable for small steamers only on the 4th; on the 12th the river was lower than it has been at any time since 1881.

#### HIGH TIDES.

New River Inlet, North Carolina: high tides occurred on



the 12th, 14th, and 15th; that on the 14th being, with one exception, the highest observed since 1869.

High tides were also observed as follows:

Ocean City, Maryland, 8th.

Jacksonville, Florida, from 15th to 18th.

Indianola, Texas, 28th.

### WATER TEMPERATURE.

The following table gives the highest and lowest temperatures of the water at the several stations; the range of water temperature; the mean temperature of the air at the station; and the depth of water at which the observations are taken:

Temperature of water for September, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey	75.0	69.5	5.5	2 8	69.7
Alpena, Michigan	72.3	55.8	16.5	12 0	60.5
Augusta, Georgia	84.8	78.0	6.8	5 0	76.4
Baltimore, Maryland	81.2	71.9	9.3	10 0	72.1
Block Island, Rhode Island	68.2	66.7	1.5	7 6	65.3
Boston, Massachusetts	65.5	57.1	8.4	21 2	65.8
Buffalo, New York	75.0	65.4	9.6	9 11	65.6
Canby, Fort, Washington Territory	62.5	50.7	11.8	16 10	55.3
Cedar Keys, Florida	86.2	79.9	6.3	10 10	80.3
Charleston, South Carolina	83.2	75.2	8.0	39 4	77.2
Chicago, Illinois	66.9	58.7	8.2	8 0	68.9
Chincoteague, Virginia	82.4	68.5	13.9	4 0	71.8
Cleveland, Ohio	75.1	64.3	10.8	14 0	67.3
Detroit, Michigan	75.6	62.9	12.7	23 10	68.4
Delaware Breakwater, Delaware	76.7	68.3	8.5	8 10	70.6
Duluth, Minnesota	65.1	52.4	12.7	10 2	57.5
Eastport, Maine	52.0	50.5	1.5	14 11	50.5
Escanaba, Michigan	66.0	59.1	6.9	18 3	60.1
Galveston, Texas	87.3	80.2	7.1	12 11	83.5
Grand Haven, Michigan	77.5	64.2	13.3	19 0	65.4
Indianola, Texas	86.2	77.5	8.7	9 3	81.0
Jacksonville, Florida	85.2	79.8	5.4	18 0	77.8
Key West, Florida	87.9	81.7	6.2	17 3	82.2
Mackinaw City, Michigan	65.1	56.2	8.9	10 0	60.6
Macon, Fort, North Carolina	84.0	70.6	13.4	8 10	75.5
Marquette, Michigan	60.5	55.6	4.9	10 0	59.9
Milwaukee, Wisconsin	57.8	43.1	14.7	8 0	54.0
Mobile, Alabama	85.6	80.0	5.6	17 2	78.3
New Haven, Connecticut	70.7	65.0	11.7	16 0	66.4
New London, Connecticut	69.6	64.2	5.4	12 6	66.9
New York City	74.4	67.4	7.0	16 2	69.6
Norfolk, Virginia	80.8	72.7	8.1	16 5	73.9
Pensacola, Florida	85.3	82.3	3.0	17 0	79.5
Portland, Maine	59.8	54.4	5.4	15 3	64.0
Portland, Oregon	71.0	50.5	14.5	53 0	55.7
Sandusky, Ohio	79.0	62.5	16.5	10 3	65.8
Sandy Hook, New Jersey	75.3	64.0	11.3	1 0	70.4
San Francisco, California	60.9	57.5	3.4	37 5	58.3
Savannah, Georgia	84.3	76.0	8.3	10 2	76.4
Smithville, North Carolina	82.5	73.0	9.5	10 9	75.9
Toledo, Ohio	77.6	65.7	11.9	11 2	69.3
Wilmington, North Carolina	82.9	72.0	10.9	20 1	75.2

### VERIFICATIONS.

#### INDICATIONS.

The detailed comparison of the tri-daily indications for September, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 81.58 per cent. The percentages for the four elements are: Weather, 88.64; direction of the wind, 77.00; temperature, 77.89; barometer, 84.49 per cent. By geographical districts, they are: For New England, 78.28; middle Atlantic states, 83.87; south Atlantic states, 88.42; eastern Gulf states, 86.67; western Gulf states, 86.20; lower lake region, 77.39; upper lake region, 77.97; Ohio valley and Tennessee, 84.77; upper Mississippi valley, 78.52; Missouri valley, 72.64; north Pacific coast region, 83.33; middle Pacific coast region, 90.83; south Pacific coast region, 98.33. There were five omissions to predict out of 2,948, or 0.17 per cent. Of the 2,943 predictions that have been made, ninety-eight, or 3.33 per cent., are considered to have entirely failed; one hundred and sixty-seven, or 5.68 per cent., were one-fourth verified; three hundred and fifty-four, or 12.03 per cent., were one-half verified; five hundred and sixty-seven, or 19.26 per cent., were three-fourths verified; 1,757, or 59.70 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

### CAUTIONARY SIGNALS.

During September, 1884, one hundred and forty cautionary signals were ordered. Of these, ninety-one, or 65.0 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Twenty-six off-shore signals were ordered, of which number sixteen, or 61.54 per cent., were fully justified, both as to direction and velocity; twenty, or 76.92 per cent., were justified as to direction; and twenty-one, or 80.77 per cent., were justified as to velocity. One hundred and sixty-six signals of all kinds were ordered, one hundred and seven, or 64.46 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Three signals were ordered late. In sixty-four cases winds of twenty-five miles or more per hour were reported, for which no signals were ordered.

Concerning the system of indicating the weather changes by means of railway signals, Professor Mell, director of the "Alabama Weather Service," states that this system has been in successful operation over a large part of that state, and that the reports received by him indicate that much interest is manifested wherever the signals have been displayed. These signals were displayed from the 11th to the close of the month, and a high percentage of verification was attained. Out of the reports from nine stations, six reported that the indications referring to temperature were fully verified; five reported the indications referring to the character of the weather fully verified; and the remaining stations reported percentages of accuracy varying from 85 to 95 per cent.

### ATMOSPHERIC ELECTRICITY.

#### AURORAS.

Brilliant and extensively observed auroral displays occurred on the evenings of the 13th and 17th; that which occurred on the last-mentioned date being observed throughout the northern portions of the United States and in British America. It was seen at Sidney, Nova Scotia, on the east; at stations on the coasts of Oregon and Washington Territory on the west; and southward to stations in southern Illinois and Indiana, and the central portions of Ohio and Kansas.

The display on the 13th, was not observed to the west of Dakota but was reported by numerous stations from the upper Missouri valley eastward to the Atlantic coast. The following reports relate to the display:

Eastport, Maine, 13th: an auroral arch was visible from 7.50 p. m. until 2 a. m. of the 14th; it extended to an altitude of 25°; several streamers of whitish color were observed during the display.

Point Judith, Rhode Island, 13th: a faint auroral light appeared at 7.50 p. m.; at 8.10 p. m. an arch of pale straw color formed, and remained visible until after midnight; the arch extended from northwest to northeast, being about 5° in width and 12° altitude; a dark haze was observed beneath the arch; no streamers were seen.

Menand Station (near Albany), New York: at 10.15 p. m., on the 13th, auroral beams of from 5° to 10° altitude were observed.

Moorestown, New Jersey: from 10.45 to 11.15 p. m. on the 13th, a few auroral streamers were observed.

Oswego, New York: an auroral light of pale straw color appeared at 10.50 p. m.; only a few streamers were noticed; the light faded gradually and by 12.50 a. m. it had entirely disappeared.

Rochester, New York: from 9.30 to 10.10 p. m., on the 13th, an aurora was visible in the northern sky; beams of light suddenly shot upward to a height of 45° and were followed by a wave of light having a slow motion from west to east.

Thornville, Michigan: a faint auroral display was visible from 9 to 11 p. m., on the 13th.

Riley, Illinois: a poorly-defined auroral arch of unusual brilliancy was observed at 10 p. m., on the 13th.

Summary of meteorological data for stations of the Signal Service, Sept., 1884.

Stations.	Elevation above sea-level.	Mean barometer corrected for temperature and error.	Departure from normal.	Temperature.			Wind.			Total movement.	Rainfall.
				Monthly mean.	Maximum.	Minimum.	Prevailing direction.	Max. velocity.	Direction.		
New England.											
Block Island.....	27	30.07	+0.3	65	83	10 14 s.w.	32	.....	8,668	0.62	
Boston.....	142	29.92	+0.1	66	94	10 40 14 s.w.	25 n.	13	6,101	0.31	
Eastport.....	61	29.94	.....	56	83	5 38 14 s.	29 n.	16	4,239	1.89	
Mount Washington.....	6,279	23.88	-0.1	41	63	4 14 14 n.w.	96 n.w.	20	29,335	7.58	
New Haven.....	107	29.98	+0.3	66	90	10 40 14 s.w.	22 s.w.	16	4,047	1.41	
New London.....	47	30.06	+0.3	67	89	10 45 15 s.w.	23 s.; s.w.	3	8,854	1.18	
Portland.....	45	30.00	+0.1	64	88	6 40 14 s.	28 n.	23	5,087	0.56	
Middle Atlantic states.											
Albany.....	75	30.00	+0.1	68	90	10 42 14 s.	22 s.	27	3,759	1.80	
Atlantic City.....	13	30.09	.....	70	86	29 50 14 s.w.	27 s.w.	16	5,732	0.34	
Baltimore.....	45	30.07	.....	72	93	10 49 15 s.	18 s.	24	3,576	0.09	
Barnegat City.....	22	30.09	+0.5	69	86	5 52 21 s.w.	32 s.w.	16	8,978	1.05	
Cape Henry.....	16	30.11	.....	74	90	9 60 20 s.	41 n.e.	14	8,407	0.42	
Cape May.....	27	30.08	+0.5	71	84	29 48 14 s.	32 s.	16	9,218	0.31	
Chincoteague.....	8	30.11	.....	72	88	55 19 s.	44 n.e.	13	5,832	0.33	
Delaware Breakwater.....	20	30.10	.....	71	88	9 55 23 s.w.	58 n.e.	14	10,697	0.99	
Lynchburg.....	652	29.44	+0.5	72	94	8 47 15 s.	20 s.	11	1,860	0.21	
New York.....	164	29.94	.....	70	92	10 51 14 s.	27 s.	29	6,203	1.15	
Norfolk.....	30	30.10	.....	74	89	30 59 15 s.	22 n.e.	14	4,716	0.17	
Philadelphia.....	117	30.00	.....	71	94	9 48 14 s.	28 s.	16	5,769	0.20	
Sandy Hook.....	28	30.08	.....	70	94	7 52 14 s.w.	39 n.; n.w.	9	9,740	0.03	
Washington.....	106	30.02	+0.5	72	97	9 45 15 s.	19 n.w.	18	3,486	0.14	
South Atlantic states.											
Atlanta.....	1,129	28.96	+0.4	75	88	52 15 s.	28 s.	14	5,672	0.08	
Augusta.....	183	29.94	+0.4	70	91	3 57 17 n.e.	22 n.	12	2,861	4.24	
Charleston.....	52	30.02	+0.1	77	89	1 62 15 s.	32 n.; n.e.	6	6,003	11.03	
Charlotte.....	808	29.30	+0.8	73	91	8 49 15 n.e.	17 n.e.	13	3,345	3.57	
Fort Macon.....	11	30.12	.....	70	85	10 64 15 n.e.	44 n.	14	9,939	5.56	
Hatteras.....	12	30.10	.....	75	86	5 64 19 n.e.	32 n.e.	13	3,977	1.01	
Jacksonville.....	43	30.02	+0.2	78	89	12 64 17 n.e.	21 e.	20	4,133	0.68	
Kitty Hawk.....	22	30.12	.....	75	88	8 62 6 n.e.	50 n.e.	13	9,372	0.15	
Savannah.....	87	29.99	+0.2	76	88	18 60 15 s.	24 e.	10	4,832	4.55	
Smithville.....	34	30.09	+0.6	76	84	17 59 15 s.	32 s.e.	12	7,278	3.11	
Wilmington.....	52	30.06	+0.5	75	89	29 58 15 s.	22 n.e.	14	3,528	9.34	
Eastern Gulf states.											
Mobile.....	35	30.02	+0.3	78	94	12 61 16 n.e.	24 s.e.	23	4,498	1.78	
Montgomery.....	219	29.84	+0.1	79	92	12 58 17 s.e.	16 s.e.	3	3,130	0.58	
New Orleans.....	52	29.97	.....	81	92	12 70 16 e.	24 s.e.	7	4,576	3.12	
Pensacola.....	30	30.02	.....	80	94	11 65 17 s.	21 n.e.	6	3,994	4.83	
Vicksburg.....	244	29.81	+0.1	78	94	11 62 1 e.	21 s.e.	3	3,467	5.12	
Western Gulf states.											
Fort Smith.....	451	29.52	-0.7	77	100	7 59 1 e.	14 e.	3	3,078	5.03	
Galveston.....	40	29.96	-0.1	84	90	74 4 s.e.	27 s.e.	27	6,419	7.04	
Indianola.....	26	29.95	-0.2	81	90	24 69 28 s.	37 s.e.	28	6,299	9.60	
Little Rock.....	299	29.71	-0.2	77	93	11 58 19 s.e.	24 s.e.	3	1,678	5.00	
Palm Springs.....	533	29.46	-0.6	80	95	7 61 2 s.	27 s.	3	5,736	4.00	
Shreveport.....	227	29.78	-0.2	80	97	6 62 2 s.e.	16	.....	3,296	2.10	
Ohio valley & Tennessee.											
Chattanooga.....	783	29.29	+0.2	73	90	7 52 19 s.	20 s.	22	2,675	2.80	
Cincinnati.....	620	29.44	+0.1	74	91	11 55 21 s.w.	21 s.w.	28	3,210	3.07	
Columbus.....	805	29.23	+0.1	71	92	8 40 21 s.w.	30 s.w.	3	3,679	3.46	
Indianapolis.....	753	29.26	+0.1	72	92	8 45 21 s.	18 n.; n.w.	3	3,664	3.66	
Knoxville.....	980	29.10	+0.2	72	92	8 50 19 n.e.	18 n.; s.w.	2	2,856	0.66	
Louisville.....	530	29.51	+0.3	74	92	9 50 21 s.	28 w.; s.	4	1,152	5.90	
Memphis.....	331	29.74	+0.1	77	94	9 01 19 s.e.	25 s.e.	3	3,345	4.29	
Nashville.....	549	29.50	+0.1	74	91	3 52 19 s.	27 s.	32	3,182	2.36	
Pittsburg.....	766	29.28	+0.1	70	100	10 44 21 n.	24 s.w.	24	3,587	1.17	
Lower lake region.											
Buffalo.....	690	29.33	+0.1	66	88	10 40 14 s.w.	44 s.w.	28	7,051	1.77	
Cleveland.....	690	29.34	.....	67	89	3 41 21 s.	40 s.w.	24	6,218	3.76	
Detroit.....	661	29.35	.....	68	89	10 45 21 s.	38 s.w.	24	5,945	2.70	
Erie.....	681	29.34	+0.1	67	87	4 43 14 s.	26 s.w.	24	6,175	3.92	
Oswego.....	634	29.09	+0.3	64	82	4 40 14 s.	30 s.	24	6,610	1.92	
Rochester.....	621	29.40	+0.2	65	82	7 38 19 s.w.	36 s.w.	16	7,611	1.90	
Sandusky.....	639	29.39	+0.1	69	86	4 48 19 s.w.	42 s.w.	24	8,107	3.17	
Toledo.....	651	29.35	-0.1	69	92	9 47 21 s.	38 s.	24	5,731	1.02	
Upper lake region.											
Alpena.....	609	29.32	-0.6	60	93	9 35 23 w.	48 w.	10	6,291	4.83	
Chicago.....	661	29.31	-0.2	69	89	9 51 21 s.w.	24 w.	17	5,800	5.29	
Duluth.....	687	29.16	-0.8	58	81	2 45 18 n.e.	41 n.e.	30	6,306	4.70	
Escanaba.....	613	29.27	-0.8	60	89	4 41 20 s.	30 n.	24	6,256	8.77	
Grand Haven.....	620	29.35	-0.2	65	82	8 39 21 s.	30 s.	16	7,930	4.15	
Mackinaw City.....	605	29.32	-1.1	61	89	10 42 23 s.w.	32 s.w.	16	7,016	1.96	
Marquette.....	673	29.21	-0.7	60	89	6 38 22 s.w.	29 w.	16	6,769	4.91	
Milwaukee.....	697	29.25	-0.3	64	89	10 46 18 s.	35 n.w.	17	7,330	2.82	
Port Huron.....	633	29.33	-0.3	65	92	10 39 14 s.	37 w.	24	5,823	1.87	
Upper Mississippi valley.											
Cairo.....	377	29.68	-0.1	74	91	8 57 18 s.	29 s.w.	17	4,363	5.02	
Davenport.....	615	29.33	-0.5	70	90	8 51 18 s.w.	25 s.w.	28	6,130	4.79	
Des Moines.....	849	29.07	-0.6	68	92	8 43 25 s.; s.w.	26 s.w.	15	4,168	5.46	
Dubuque.....	665	29.27	-0.5	68	92	8 47 20 s.	38 s.e.	23	3,750	4.07	
Keokuk.....	618	29.34	-0.3	71	90	9 50 25 s.	36 s.e.	19	6,378	4.25	
La Crosse.....	725	29.17	-0.6	67	88	8 50 20 s.	26 n.	20	5,599	10.01	
Saint Louis.....	583	29.42	-0.2	74	92	9 54 12 s.	62 s.; s.w.	8	1,174	6.04	
Saint Paul.....	801	29.05	-0.7	64	87	5 44 20 s.	28	.....	5,894	4.48	
Springfield.....	644	29.37	.....	71	91	9 51 21 s.	29 w.	28	5,780	6.86	
Missouri valley.											
Fort Bennett.....	1,510	28.30	-0.9	62	92	30 30 n.w.	32 s.e.	12	6,877	0.68	
Huron.....	1,305	28.50	-1.0	60	90	2 30 20 s.e.	34 n.w.	15	7,921	1.26	
Leavenworth.....	842	29.07	-0.7	72	90	3 49 25 s.	29 s.	30	5,586	5.38	
Omaha.....	1,113	28.77	-0.9	69	90	8 49 20 s.	30 s.; n.	6	1,657	4.91	
Vankton.....	1,228	28.60	-1.0	64	88	5 39 20 s.	33 s.w.	25	6,088	0.28	

Summary of meteorological data for stations of the Signal Service, Sept., 1884.—Continued.

Stations.	Elevation above sea-level.	Mean barometer corrected for temperature and error.	Departure from normal.	Temperature.				Wind.				Rainfall.
				Monthly mean.	Departure from normal.	Maximum.	Date.	Minimum.	Date.	Prevailing direction.	Max. velocity.	
<i>Extreme northwest.</i>												
Moorhead.....	923	28.87	-1.12	52	+2.4	84	5 36 20 s.	40 s.	13	7,906	2.49	
Bismarck.....	1,694	28.07	-1.10	56	+0.6	82	13 33 30 n.w.	35 w.	3	6,187	2.34	
Fort Buford.....	1,930	27.85	-1.16	52	+1.9	80	20 28 30 w.	46 w.	3	7,516	0.53	
Saint Vincent.....	804	28.96	-1.11	54	+1.8	80	5 32 27 w.	33 s.e.; s.	8	6,662	3.44	
Fort Totten.....	.....	28.26	.....	54	.....	88	5 34 30 w.	51 w.	3	.....	2.04	
<i>Pacific coast region.</i>												
Cape Mendocino.....	637	29.32	+0.4	56	.....	68	16 45 30 n.	62 s.e.	20	13,419	1.18	
Fort Canby.....	179	29.78	.....	55	.....	64	42 30 s.	48 s.e.	3	6,767	6.28	
Los Angeles.....	371	29.56	.....	60	-2.2	92	21 46 17 w.	18 w.	21	3,583	Inap.	
Olympia.....	36	29.96	-0.5	55	-0.8	70	1 41 26 s.w.	17 s.w.	1	1,641	3.06	
Portland.....	67	29.95	-0.2	59	-5.2	72	1 43 26 s.	19 s.	8	3,161	4.25	
Red Bluff.....	332	29.58	-0.3	67	-5.4	95	1 40 9 n.	26	.....	4,521	0.36	
Roseburg.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Sacramento.....	64	29.86	+0.2	65	-4.9	94	1 49 6 s.	27 n.w.	26	4,847	0.60	
San Diego.....	67	29.85	+0.1	65	-1.7	78	10 51 16 n.w.	19 n.w.	27	4,195	0.07	
San Francisco.....	60	29.91	+0.2	58	-1.3	73	16 52 27 w.	30 w.	1	7,200	0.33	
<i>Northern slope.</i>												
Assinaboine.....	2,720	27.08	-0.9	50	-3.7	77	1 25 30 n.w.	50 n.w.	3	6,722	2.69	
Cheyenne.....	6,105	24.01	-0.8	59	-0.7	82	1 28 30 n.w.	45 n.w.	10	8,596	1.25	
Deadwood.....	4,600	25.33	-0.7	53	-0.7	78	13 28 30 s.w.	22 s.	8	2,532	1.99	
Fort Benton.....	2,681	27.15	-0.7	53	-3.6	89	20 34 30 s.w.	40 s.w.	27	5,059	1.44	
Fort Custer.....	3,040	26.77	-0.8	54	-3.7	85	20 31 30 n.	36 n.w.	3	4,603	1.42	
Fort Maginnis.....	4,340	25.50	-1.4	47	.....	79	20 26 30 s.w.	40	.....	2,722	0.26	
Fort Shaw.....	3,350	26.30	-0.9	48	-5.3	80	21 21 30 w.	42 w.	27	6,322	2.39	
Helena.....	4,044	25.79	-0.9	50	-7.9	74	20 21 30 s.w.	29 w.	2	4,523	1.30	
Poplar River.....	.....	.....	.....	52	.....	79	1 28 30 w.	..... w.	3	.....	0.64	
Spokane Falls.....	1,906	27.92	-0.5	52	-3.7	75	20 33 26 s.w.	19 s.w.	1	3,289	2.43	
<i>Middle slope.</i>												
Denver.....	5,294	24.72	-0.9	65	+3.7	88	1 40 24 s.	48 s.	7	4,544	0.13	
Dodge City.....	2,517	27.35	-1.1	70	+3.3	92	3 46 28 s.e.	42 s.e.	5	11,296	0.23	
Fort Elliott.....	2,650	27.22	-0.7	73	-6.2	95	10 46 28 s.e.	40 s.e.	24	8,144	0.84	
North Platte.....	2,841	27.00	-1.0	65	+3.5	91	4 40 17 s.e.	36 s.e.	8	5,562	0.80	
Pike's Peak.....	14,134	17.95	-0.1	52	.....	47	21 18 24 s.w.	64 n.w.	28	16,517	0.49	
West Las Animas.....	3,959	25.97	-1.13	67	+3.0	95	27 30 30 s.w.	29 s.	7	5,978	0.06	
<i>Southern slope.</i>												
Fort Concho.....	1,909	28.06	-0.5	78	.....	99	6 62 1 s.	35 w.	5	5,876	3.60	
Fort Davis.....	4,928	25.22	-0.3	76	+2.8	88	7 49 28 s.w.	20 n.e.	23	3,362	3.74	
Fort Sill.....	1,200	28.71	-0.9	79	.....	99	1 53 25 s.	36 s.	30	8,206	2.24	
Fort Stockton.....	3,010	26.97	-0.5	75	+3.6	95	7 57 28 s.e.	30 w.n.w.	.....	5,453	5.84	
<i>Northern plateau.</i>												
Buise City.....	2,750	27.15	-0.3	55	-6.3	80	1 35 29 w.	21 w.n.w.	.....	2,712	2.11	
Dayton.....	1,667	28.23	-0.4	54	-4.7	82	20 31 26 s.w.	20 s.w.	27	4,176	1.40	
Lewiston.....	780	29.16	.....	57	-3.9	82	20 35 26 n.e.	19	.....	1,706	1.01	
<i>Middle plateau.</i>												
Salt Lake City.....	4,348	25.59	-0.6	59	-6.1	87	4 37 10 s.e.	29 n.w.	26	3,844	1.91	
<i>Southern plateau.</i>												
Camp Thomas.....	2,710	27.18	-0.2	73	-0.2	100	22 43 28 s.	.....	.....	.....	.....	
El Paso.....	3,764	26.24	-0.4	73	+0.2	98	5 49 28 s.	14 s.w.	2	1,556	3.91	
Fort Apache.....	5,050	25.02	-0.4	61	-4.0	88	20 33 28 s.w.	26 s.w.	26	4,202	1.50	
Fort Grant.....	4,856	25.22	-0.6	71	+0.4	93	19 56 9 n.	29 s.e.	11	4,225	0.98	
Prescott.....	5,389	24.74	-0.2	60	-3.0	87	20 32 15 s.	34 n.w.	7	4,774	0.99	
Yuma.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
<i>Rio Grande valley.</i>												
Brownsville.....	59	29.88	-0.5	80	+1.1	96	2 69 1 s.	28 s.	27	4,822	8.96	
Rio Grande City.....	230	29.74	-0.3	83	+0.4	103	4 70 1 s.e.	28	.....	4,580	7.30	
<i>Florida peninsula.</i>												
Cedar Keys.....	22	30.03	+0.2	80	+0.9	90	67 16 n.e.	32 n.e.	5	6,281	3.63	
Key West.....	20	29.98	+0.1	82	-0.7	92	1 73 24 s.	32 s.w.	17	6,337	7.08	
Sanford.....	36	29.96	-0.2	78	.....	95	11 64 17 n.e.	28 n.e.	24	4,307	3.80	



in the north during the evening of the 13th. An arch of white light extended across the sky from northwest to southeast, passing south of the zenith. At 11 p. m., waves of white light flashed upward to a height of  $45^\circ$  from a dark cloud in the north.

Duluth, Minnesota: at 9.30 p. m., on the 13th, an auroral light of yellowish green color, was observed, extending from  $160^\circ$  to  $220^\circ$ , azimuth; a few faint beams were observed at intervals during the display. At 10.35 p. m., a well defined and bright beam shot upward from azimuth  $160^\circ$ , and extended to the zenith, having a width of about one half degree; from the zenith it inclined eastward to about  $220^\circ$  degrees, azimuth, tapering to a point, and fading out at about  $20^\circ$  above the horizon; this beam remained visible for eight minutes. The display was obscured by clouds at 11.30 p. m.

Saint Paul, Minnesota: an auroral display in the form of a segment of pale straw-colored light, with a dark slate-colored base, was observed between 8.55 and 9.25 p. m. on the 13th. The light extended from  $175^\circ$  to  $205^\circ$ , azimuth, and to a height of  $15^\circ$  at the centre. At 9.15 p. m., a few slender beams shot upward to a height of  $30^\circ$ ; these vanished and reappeared in rapid succession from 9.15 to 9.25 p. m.

Moorhead, Minnesota: a part of an auroral arch of  $12^\circ$  altitude was seen through the broken clouds in the northern sky on the evening of the 13th.

Saint Vincent, Minnesota: an auroral light appeared at 8.15 p. m. of the 13th; it consisted of a well-defined arch extending across the northern sky, having an altitude of  $30^\circ$  at its centre. Bright streamers flashed upward from the arch, nearly reaching the zenith, and afterwards fading away. Beneath the arch there was an incessant display of lightning from cumulo-stratus clouds, while between the latter and the arch the stars shone brightly. The display was hidden by clouds at 11 p. m.

Fort Totten, Dakota: an auroral light appeared in the north at 8.30 p. m. on the 13th; at 9 p. m. a single beam extended from the eastern to the northwestern horizon, passing through the zenith. This beam was about  $2^\circ$  in width and remained very bright for about one hour, while the northern sky was illuminated by a beautiful arch with a dark segment beneath, where rapid flashes of sheet lightning were observed. The display ended at 11.20 p. m.

Fort Yates, Dakota: a fine auroral display appeared at 7 p. m., on the 13th; it consisted of two luminous bands, which reached their greatest brilliancy at 9.30 p. m. The display continued until 2.30 a. m. of the 14th.

The following reports relate to the display observed on the 17th:

Eastport, Maine: an auroral arch of whitish color and of  $25^\circ$  altitude at its centre, was observed from 7.50 to 11 p. m., on the 17th.

Portland, Maine: an aurora was visible from 8.45 p. m. on the 17th to 2 a. m. on the 18th. It first appeared as a dim light, which gradually assumed the form of a band of whitish light having a fold in itself near the centre. As the band decreased in brilliancy, rays of light appeared, reaching to the zenith.

New London, Connecticut, 17th: a faint aurora became visible at 8.10 p. m. and continued until obscured by clouds at 10.15 p. m.

Point Judith, Rhode Island: from 9 p. m. of the 17th until after midnight an auroral light was observed through the openings in the clouds.

Ithaca, New York: a faint auroral light was seen through the clouds on the evening of the 17th.

Hiram, Ohio: a distinct auroral light was observed in the east at 9 p. m. on the 17th.

Sandusky, Ohio: a faint aurora appeared at 10.38 p. m. of the 17th. At midnight, a bright band, which remained visible fifteen minutes, extended across the sky from the northwest to southeast.

Toledo, Ohio: at 8 p. m. on the 17th an auroral arch having

an altitude of about  $10^\circ$  and resting on a dark segment, appeared in the northern sky. The display continued with varying brilliancy until 1.30 a. m. of the 18th.

Wilton Centre, Illinois: at 10 p. m. on the 17th was observed an auroral light consisting of a well-defined arch, the centre of which was of about  $25^\circ$  altitude. This display was also seen at Sycamore and Swanwick in this state.

Vevay, Indiana: a faint auroral light was observed at 10 p. m. on the 17th.

Spiceland, Indiana: an auroral glow was visible at 9 p. m. on the 17th; no streamers were observed.

Wabash, Indiana: an aurora was observed at 10 p. m. on the 17th.

Ionia, Michigan: an aurora was visible from 8.30 to 10.30 p. m. on the 17th.

Escanaba, Michigan: an aurora appeared at 8.20 p. m. on the 17th; the light was at first partly obscured by clouds, but as the clouds disappeared it became very bright, at 10.35 p. m., numerous beams rose slowly from behind the clouds, and at 10.47, flashes of bright yellow light extended from northwest to northeast, and to within  $10^\circ$  of the zenith.

La Crosse, Wisconsin: on the 17th at 8 p. m. an aurora, consisting of an arch of light resting on a dark segment, extended over above  $60^\circ$  of the northern sky. The centre of the arch was about  $6^\circ$  east of the magnetic meridian, and of about  $25^\circ$  altitude; the display gradually faded, no traces of it remaining at 2 a. m.

Keokuk, Iowa: a faint auroral light, extending over about  $100^\circ$  of the northern horizon, was observed at 9.45 p. m., on the 17th; it was of pale straw-color, and extended upward  $15^\circ$ . The display was brightest at 10.15 p. m., when two streamers shot upward from the northern horizon to an altitude of  $50^\circ$ . At 11 p. m. the display was very indistinct.

Davenport, Iowa: at 10 p. m. of the 17th a bright straw-colored, auroral light extended over about  $90^\circ$  of the northern horizon, and to an altitude of  $30^\circ$ ; at 10.30 p. m. a complete arch was formed, with bright streamers reaching a height of  $45^\circ$ . The display ended at 11.30 p. m.

Duluth, Minnesota: an aurora appeared at 7.30 p. m. on the 17th; at 8.10 two arches were visible, their centres being of about  $30^\circ$  and  $45^\circ$  altitude, respectively. Both of these arches were poorly defined; they disappeared at 10 p. m., leaving only a pale, green light with occasional streamers, which remained visible until 3.20 a. m.

Moorhead, Minnesota: faint auroral streamers were seen at 7.30 p. m. on the 17th; at 9 p. m. flashes of light rolled upward from a point slightly east of north toward the zenith. Cloudiness partially obscured the display, which was still visible at midnight.

Bismarck, Dakota: a brilliant auroral display was visible on the 17th at 9.30 p. m., at which time the northern horizon was partially obscured by stratus clouds; auroral streamers of deep red color extended to a height of  $45^\circ$ ; at 10.00 p. m. the converging streamers formed at the zenith a beautiful corona, which had a quivering motion. The telegraph wires were affected during the display, communication between this place and Saint Paul, Minnesota, being seriously interfered with.

Huron, Dakota: from 8 p. m. until nearly midnight on the 17th a bright auroral arch extended across the sky from northwest to northeast; at midnight a band of white light spanned the sky from west to east, passing through the zenith; this band remained visible for forty minutes.

Genoa, Nebraska: a fine display of the aurora was observed on the evening of the 17th. This display was also observed at Yutan, Red Willow, Marquette and Crete, Nebraska.

Salina, Kansas: a bright, yellow auroral light was observed during the evening of the 17th.

Allison, Kansas: between 8 and 9 p. m. on the 17th, a faint auroral glow was observed; the light increased in brilliancy from 9 to 9.45 p. m., when streamers extending upward  $25^\circ$  were visible.

Sherlock, Kansas: from 8 to 9 p. m. on the 17th, was ob-

served a moderately bright aurora, reaching from the horizon to a bank of clouds about 10° above.

Poplar River, Montana: an auroral light of pale blue color, covering 20° of the northern sky, was visible from 8.30 to 11 p. m. on the 17th.

Fort Benton, Montana: brilliant auroral beams were visible from 7 to 9.30 p. m. on the 17th; they covered the sky from northwest to northeast and extended to an altitude of 90°. The beams were observed to have a very slight movement.

Helena, Montana: on the 17th an auroral display was visible from 8 to 8.20 p. m., after which it became obscured.

Lewiston, Idaho: on the 17th at 7.30 p. m. an auroral light covered the sky from northwest to north-northeast, and to an altitude of 30°. It first appeared as a dark segment from which numerous bright streamers flashed upward, fading and reappearing at short intervals. The display was brightest at 8 p. m., when "merry dancers" extended from west to east, flashing across the northern horizon, and reaching a height of 45°; after 8 p. m. the aurora began to fade, and by 9 p. m. it had entirely disappeared.

Dayton, Washington Territory: a bright auroral display was observed from 7 to 9.40 p. m. on the 17th; bright yellow streamers were visible for fifteen minutes; at 9 p. m. a pale white arch remained visible.

Astoria, Oregon: a fine auroral display was observed between 8.30 and 9.15 p. m., on the 17th; it consisted of long, slender beams of pale yellow color, rising from a dark base, and shooting upwards to heights of from 30° to 90°.

Pleasant Grove, Washington Territory: an auroral arch with "merry dancers" was observed from 9 to 11 p. m. on the 17th. This display was also seen at Crescent bay.

Auroral displays occurred on other dates during the month as follows:

3d.—Fort Yates, Dakota.

10th.—Eastport, Maine.

12th.—Williamstown and Thatcher's Island, Massachusetts; Prairie du Chien, Wisconsin; Point Judith, Rhode Island.

14th.—Cornish, Gardiner, and Portland, Maine; Oswego and Syracuse, New York; Burlington, Vermont; Lancaster, Wisconsin.

15th.—Cornish, Maine; Chester, Minnesota; Burlington, Iowa.

18th.—Bismarck, Fort Buford, Fort Totten, Fort Yates, and Webster, Dakota; Orono and Eastport, Maine; Traverse City, Michigan; Duluth and Moorhead, Minnesota.

21st.—Yutan, Nebraska.

26th.—Mountainville, New York.

#### THUNDER-STORMS.

Thunder-storms were reported in the following districts as follows:

*New England.*—6th, 7th, 8th, 10th, 11th, 14th, 15th, 18th to 23d, 25th, 26th, 28th, 29th.

*Middle Atlantic states.*—6th to 12th, 14th, 17th, 20th to 23d, 25th, 27th to 30th.

*South Atlantic states.*—5th, 7th to 10th, 12th, 18th, 20th, 21st, 22d, 25th, 26th, 30th.

*Florida peninsula.*—1st to 6th, 9th to 13th, 15th to 30th.

*East Gulf states.*—2d, 3d, 6th, 8th, 9th, 20th, 21st, 24th, 27th, 28th.

*West Gulf states.*—3d, 4th, 5th, 7th to 17th, 19th to 30th.

*Rio Grande valley.*—4th, 7th to 11th, 13th, 14th, 19th, 20th, 27th, 28th, 30th.

*Tennessee.*—3d, 6th to 11th, 16th, 17th, 19th to 24th, 26th to 30th.

*Ohio valley.*—5th, 7th to 12th, 15th, 17th to 24th, 27th to 30th.

*Lower lake region.*—4th to 11th, 13th, 17th to 20th, 22d, 23d, 24th, 27th, 28th, 29th.

*Upper lake region.*—1st to 10th, 14th, 15th, 16th, 19th to 24th, 26th to 30th.

*Extreme northwest.*—1st, 2d, 5th, 8th, 9th, 10th, 12th to 15th, 18th, 21st, 22d.

*Upper Mississippi valley.*—1st to 11th, 13th to 19th, 21st to 24th, 26th to 30th.

*Missouri valley.*—1st to 10th, 12th to 16th, 18th to 23d, 25th to 30th.

*Northern slope.*—3d, 6th, 7th, 9th, 14th, 18th.

*Middle slope.*—1st to 10th, 12th to 16th, 18th, 19th, 20th, 22d to 27th, 30th.

*Southern slope.*—3d to 7th, 9th to 12th, 22d, 26th.

*Southern plateau.*—1st to 8th, 10th, 12th, 13th, 14th, 15th, 19th to 23d, 25th, 31st.

*Middle plateau.*—2d, 12th, 13th, 14th, 22d.

*North Pacific coast region.*—5th, 10th, 11th, 27th, 28th, 29th.

*Middle Pacific coast region.*—4th, 6th, 8th, 12th, 13th, 14th, 30th.

Thunder-storms were also reported at the following stations, not included in the districts named above:

San Diego, California, 20th.

Coeur d'Alene, Idaho, 14th.

Professor H. A. Hazen, of the Signal Service, has prepared the following notes on the thunder storms of September, 1884:

Reports from special voluntary observers from north of lat. 35° and east of 102° west longitude. The total number of reports received was 1,575; of these the largest number were: for storms on the 7th, 85; 8th, 105; 9th, 111; 10th, 132; 11th, 86; 22d, 89; 23d, 78, and 28th, 76.

On the 7th, action was general in Missouri, Illinois, Indiana and Ohio, to southeast of a large trough of low pressure lying between two "highs," also in New England at about 420 miles southeast of "low."

On the 8th and 9th there were frequent storms in Iowa, Wisconsin and Illinois, 450 miles to southeast and east of "low." These storms on the 9th were all about the tornadoes which occurred in Iowa and Wisconsin.

The most general action occurred on the 10th. It seems probable that there were two centers for these storms, the one in Iowa and the other in Ohio; the first note of them was at 1 p. m., and they gradually worked east, the first disappearing about 9 p. m. in southern Indiana and the second at 8 p. m., off the Atlantic coast. The mean distance from "low" was about 500 miles to southeast and south.

On the 11th general action occurred in Pennsylvania, New Jersey, New York and Massachusetts, about 400 miles south-southeast of "low."

On the 27th general action occurred to south of "low" about 450 miles, in Illinois, Indiana and Ohio. The hurricanes of this date in Ohio were just to the north of the most frequent storms.

On the 28th action began in Indiana at 8 a. m., 600 miles to southeast of "low," from thence passing nearly due east, it culminated in terrific winds and even tornado action at 5 p. m. in Alton, Pennsylvania, and at 6.20 p. m. in Shongo, New York, thence passing eastward, the last noted was in Heath, Massachusetts, from 11 p. m. to midnight.

On the 30th general action is recorded in Illinois and Indiana, 550 miles south of "low."

The records in both August and September indicate an intimate relation between the "low" centre and the region of general thunder-storm action, the latter occurring in a south or southeast direction at a mean distance of 450 to 500 miles. It should be understood, however, that a well-defined "low" is not always accompanied by such action in summer. In nearly every instance specially noted in August and this month the "low" has been of medium or light intensity.

It has also been noted that while there are occasional cloud-bursts and enormous rainfalls in connection with the storms, yet such rainfall has not been as general over a large region as in the case of well-defined "lows." This suggests the idea that possibly a general rain allows the electricity to pass to the earth by insensible degrees and thus prevents its accumulation in sufficient amount to produce thunder-storm action.

TABLE I.—Mean number of thunder-storms in September at each station, by districts.

District.	1854-1873.		1884.		Difference.	
	Stations.	No.	Stations.	No.	Stations.	No.
I.....	20	1.84	44	2.52	24	+.68
II.....	15	2.26	60	1.47	45	-.79
III.....	20	2.60	90	2.93	70	+.33
IV.....	9	2.78	20	3.15	11	+.37
V.....	11	2.85	61	3.44	50	+.59
Total.....	75	2.39	275	2.68	203	.29

In order to compare the records for this September with those of voluntary observers for the same month between the years 1854 and 1873 Table i. has been prepared.

In this, column one shows the districts defined as follows: i., New England and New York; ii., Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, and West Virginia; iii., Illinois, Indiana, Kentucky,



Ohio, and Tennessee; iv., Michigan, Minnesota, and Wisconsin; v., Dakota, Iowa, Kansas, Missouri, Montana, and Nebraska. Column two shows the mean number of stations in each district for twenty years. Column three shows the mean number of storms at each station. Columns four and five give stations and mean number of storms for 1884. Column six gives the excess of stations in the present year, and the last column gives the excess or deficiency in storms for 1884 as compared with the mean of twenty years. Every district but one, it will be noted, shows an increase. The large deficiency in district ii. is readily accounted for when we consider that in this district there has been a protracted drought, and the conditions producing that were unfavorable to the development of thunder-storms.

TABLE II.—Mean number of thunder-storms per station in all districts for September.

Year.	Stations.	No.	Departure.	Magnetic Declination.	Departure.	Year.	Stations.	No.	Departure.	Magnetic Declination.	Departure.
1851.....	46	2.22	-.16			1864.....	37	2.24	-.30	3.40	.18
1852.....	32	1.94	-.45			1865.....	66	2.08	-.30	2.67	-.55
1853.....				4.29	1.07	1866.....	94	1.83	-.55	2.39	-.63
1854.....	90	2.64	.26	3.21	-.01	1867.....	106	1.59	-.79	1.81	-1.41
1855.....	58	2.89	.51	3.23	-.01	1868.....	105	2.43	-.05	2.94	-.28
1856.....	70	2.10	-.28	2.72	-.50	1869.....	89	1.97	-.41	2.84	-.38
1857.....	65	2.74	.36	3.79	.57	1870.....	33	2.39	-.01	4.09	.87
1858.....	87	2.62	.23	2.83	-.61	1871.....	66	1.41	-.97	3.39	.17
1859.....	58	2.10	-.28	3.71	.49	1872.....	133	3.74	.46	4.00	.78
1860.....	78	2.71	.33	3.59	.37	1873.....	95	2.54	.16	3.15	-.07
1861.....	83	2.45	.07	3.72	.50						
1862.....	40	2.32	-.06	2.98	-.24	Mean.....		2.38		3.22	
1863.....	63	2.13	-.25	2.64	-.58						

In order to determine the relation, if any, between thunder-storm action and fluctuations of the earth's magnetism Table ii. has been prepared. This shows in column one, the year; in column two, the total number of stations reporting thunder-storms; in column three, the mean number of storms per station; in column four, the departure from the mean for twenty-two years (a minus sign indicating deficiency); in column five, the mean diurnal range of the magnetic declination at Trevandrum, and in column six, the departure from the mean. It will be seen that with two exceptions the maximum and minimum points in the two phenomena coincide. This would seem to show a relation between the two and the necessity of observing fluctuations of the magnetic needle in connection with detailed observations of atmospheric electricity.

## OPTICAL PHENOMENA.

### SOLAR HALOS.

Solar halos were observed in the various states and territories, as follows:

**Arkansas.**—Fort Smith, 13th; Lead Hill, 13th, 18th, 22d, 25th, 28th, 30th.

**California.**—San Francisco, 4th, 14th, 17th, 19th, 30th; Cape Mendocino, 14th; Oakland, 14th, 30th.

**Florida.**—Pensacola, 1st, 4th, 13th; Archer, 10th.

**Idaho.**—Boisé City, 2d, 17th, 30th.

**Illinois.**—Riley, 14th; Anna, 27th.

**Indian Territory.**—Cantonment, 22d.

**Iowa.**—Davenport, 27th.

**Kansas.**—Sherlock, 22d.

**Louisiana.**—New Orleans, 3d.

**Michigan.**—Escanaba, 1st, 5th, 14th, 21st, 22d, 26th, 30th; Ann Arbor, 12th.

**Minnesota.**—Moorhead, 21st, 22d; Saint Vincent, 21st, 22d.

**Nebraska.**—Red Willow, 5th.

**New Jersey.**—Moorestown, 24th.

**New York.**—Buffalo, 4th, 15th, 19th, 22d, 23d; Oswego, 23d.

**North Carolina.**—Hatteras, 11th, 14th, 20th.

**Ohio.**—Toledo, 26th; Wauseon, 27th.

**Oregon.**—Albany, 4th, 26th.

**Pennsylvania.**—Erie, 15th, 23d.

**South Carolina.**—Stateburg, 4th, 26th.

**Tennessee.**—Nashville, 3d, 5th, 19th, 28th, 30th; Knoxville, 5th, 7th; Milan, 26th, Chattanooga, 30th.

**Virginia.**—Cape Henry, 4th, 6th, 24th; Dale Enterprise, 15th, 19th, 23d, 29th.

### LUNAR HALOS.

Lunar halos were observed in the various states and territories as follows:

**Alabama.**—Mobile, 29th.

**Arizona.**—Wickenburg, 1st, 2d; Fort Apache, 3d; Fort Grant, 12th.

**Arkansas.**—Lead Hill, 28th, 30th.

**Colorado.**—Grand Junction, 2d, 3d.

**Dakota.**—Deadwood, 11th.

**Delaware.**—Delaware Breakwater, 26th, 28th, 29th, 30th.

**District of Columbia.**—Washington City, 28th, 30th.

**Florida.**—Jacksonville, 1st, 2d, 28th, 29th, 30th; Cedar Keys, 1st, 4th; Pensacola, 2d; Key West, 2d, 3d, 6th, 8th; Archer, 6th; Limona, 6th.

**Georgia.**—Atlanta, 2d, 30th; Athens, 28th; Augusta, 28th.

**Idaho.**—Boisé City, 5th, 7th, 27th; Lewiston, 30th.

**Illinois.**—Riley, 3d, 14th, 26th, 27th; Anna, 28th; Chicago, 30th.

**Indiana.**—Jeffersonville, 2d to 5th, 28th; Wabash, 5th, 6th, 7th, 27th, 28th; Sunman, 28th.

**Iowa.**—Fort Madison, 26th.

**Kansas.**—Yates Centre, 5th; Fort Scott, 6th; Westmoreland, 17th; Salina, 27th; Allison and West Leavenworth, 30th.

**Kentucky.**—Louisville, 3d.

**Louisiana.**—New Orleans, 2d, 5th; Point Pleasant, 2d, 28th, 29th; Liberty Hill, 29th.

**Maine.**—Orono, 5th.

**Maryland.**—Ocean City, 23d, 28th; Woodstock, 28th.

**Massachusetts.**—Taunton, 4th, 5th, 28th.

**Michigan.**—Port Huron, 1st, 2d, 10th; Alpena, 3d; Ann Arbor, 30th; Hudson, 30th; Lansing, 30th.

**Mississippi.**—Vicksburg, 2d, 29th.

**Missouri.**—Saint Louis, 28th.

**Montana.**—Poplar River, 7th.

**Nebraska.**—Yutan, 5th.

**New Jersey.**—Sandy Hook, 4th; Somerville, 29th.

**New York.**—Albany, 27th.

**North Carolina.**—Brevard, 2d, 3d, 5th, 6th; New River Inlet, 4th; Flat Rock, 4th, 5th; Kitty Hawk, 28th; Stateville, 30th.

**Ohio.**—Wauseon, 4th, 30th; Cincinnati, 28th; Cleveland, 30th; Toledo, 30th.

**Oregon.**—Roseburg, 27th.

**South Carolina.**—Stateburg, 3d, 28th, 30th.

**Tennessee.**—Nashville, 3d, 4th, 5th, 7th, 24th, 27th, 29th, 30th; Chattanooga, 3d, 29th, 30th; Knoxville, 5th, 7th, 30th; Ashwood, 28th, 30th; Milan, 28th.

**Texas.**—Fort Stockton, 1st; Indianola, 1st to 5th, 25th; Rio Grande City, 4th; Palestine, 5th; Cleburne, 5th, 7th; Brownsville, 7th.

**Utah.**—Nephi, 1st, 2d, 3d; Salt Lake City, 2d, 28th, 30th.

**Virginia.**—Cape Henry, 2d, 3d, 6th, 28th; Chincoteague, 3d, 4th, 6th; Wytheville, 4th, 6th, 28th; Johnstown, 22d, 23d, 25th, 27th to 30th; Dale Enterprise, 26th, 28th, 29th, 30th; Norfolk, 28th.

**Washington Territory.**—Port Angeles, 2d; Spokane Falls, 28th.

**Wisconsin.**—Sussex, 27th.

**Wyoming.**—Cheyenne, 2d.

### MIRAGE.

Guttenburg, Iowa, 3d.

Northport, Michigan, 21st.

Sterling, Kansas, 30th.

## MISCELLANEOUS PHENOMENA.

### SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and fifty-eight stations show 4,701 observations to have been made, of which one was reported doubtful; of the remainder, 4,700, there were 4,047, or 86.1 per cent., followed by the expected weather.

The peculiar sunsets have continued during September, the

displays being similar to those observed in August. They were noted by the observers in the several states as follows:

**Alabama.**—Professor Mell, director of the state weather service, reports that the beautiful sunsets during September attracted universal attention.

The Signal Service observer at Mobile states that the western sky had a greenish appearance at sunset on the 25th.

**Arizona.**—Fort Bowie, 3d, 4th, 5th, 8th, 15th.

**California.**—San Francisco, 8th, 9th; Los Angeles, 2d, 3d, 4th, 8th, 9th, 11th to 18th, 20th, 26th to 29th; Hydesville, 1st, 2d.

**Connecticut.**—New Haven, 4th.

**Dakota.**—Fort Totten, 6th; Yankton, 2d, 3d, 16th, 18th, 27th, 29th, 30th.

**District of Columbia.**—Washington City, 3d.

**Florida.**—Jacksonville, 8th, 14th, 15th, 17th, 22d, 23d, 25th, 27th, 29th. Pensacola, 15th, 16th, 23d, 26th; Archer, 15th to 30th, being as brilliant as those of 1883.

**Georgia.**—Atlanta, 14th, 15th, 16th, 18th; Andersonville, at sunrise on the 4th, 5th, and from 10th to 20th, and at sunset on 1st, 4th, 5th, 10th to 20th, 30th; Forsyth, 15th, 16th, 17th.

**Illinois.**—Springfield, 17th.

**Indiana.**—Logansport, 18th; Sunman: the sunrises and sunsets throughout the month resembled those of last autumn, though not so brilliant.

**Kansas.**—Topeka: the sun glows have continued during September, being quite as brilliant as those of last year. Sherlock, 2d, 5th.

**Kentucky.**—Richmond: brilliant sunset glows on 1st, 2d, 10th, 15th, 17th, 18th, 27th, 28th, 30th.

**Maine.**—Portland, 12th, 29th; Eastport, 4th.

**Maryland.**—Baltimore, 2d, 3d.

**Massachusetts.**—Somerset, at sunrise on 4th, 8th, 10th, 11th, 12th, and at sunset from 2d to 6th and 9th; Taunton, 5th; Fall River, 1st.

**Michigan.**—Thornville, 11th, 12th; Ann Arbor, 30th.

**Missouri.**—Louisiana, 8th, 9th; Mexico, 9th; Centreville, 3d; Chamois, 8th, 9th.

**Montana.**—Fort Assinaboine, 15th.

**Nebraska.**—Red Willow, 27th.

**New Mexico.**—Fort Craig, 4th to 7th, 17th, 18th, 24th, 27th.

**New York.**—Mountainville, 2d, 3d, 5th, 10th.

**North Carolina.**—Brevard, 13th, 15th, 16th, 18th, 27th; Flat Rock, 20th.

**Ohio.**—College Hill, 10th, 16th, 20th, 21st.

**Pennsylvania.**—Fallsington, 19th, 20th, 21st.

**Rhode Island.**—Providence, 2d, 3d, 4th, 14th, 21st.

**South Carolina.**—Charleston, 15th, 16th, 18th.

**Tennessee.**—Maryville, 1st, 2d, 15th, 18th, 20th, 21st; Grief, 20th; Cookeville, 3d; Xenophon, 26th, 28th, 30th; Nashville, 1st, 15th, 18th, 20th, 27th; Hurricane Switch, on seventeen days; Hardison's Mills, 14th, 15th, 18th, 20th, 21st; Dickson, 4th; Trenton, 13th, 27th; Knoxville, 1st, 2d, 12th, 14th, 15th, 20th.

**Utah.**—Salt Lake City, 27th.

**Virginia.**—Norfolk, 2d, 8th, 21st; Fort Myer, 11th, 12th, 25th; Dale Enterprise, 2d, 4th, 10th.

**Wyoming.**—Cheyenne, 1st.

#### SUN SPOTS.

Mr. William Dawson, of Spiceland, Henry county, Indiana, reports sun spots as follows:

2d: three groups, eleven spots, all of which were small.

8th: five groups, fifty spots, mostly in the southeast quadrant.

11th: six groups, ninety spots, seventy-seven spots being in a large group near the centre.

14th: six groups, forty-eight spots.

18th: six groups, seventy spots, four of the latter being quite large.

20th: seven groups, seventy spots.

21st: seven groups, one hundred and twenty spots, one large spot near the centre.

25th: five groups, sixty spots.

26th: five groups, fifty-five spots.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for September, 1884:

Date— Sept., 1884.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 4 p. m.	0	0	0	10†	0	0	3	30†	
3, 5 p. m.	0	0	1	10†	0	0	1	5	
4, 5 p. m.	2	3	0	0	0	0	3	8	
6, 10 a. m.	2	7†	0	0	1	4	5	15†	Spots all small.
6, 11 a. m.	1	5†	0	0	0	0	6	20†	Do.
7, 4 p. m.	0	0	0	0	0	0	4	15†	Do.
9, 12 m.	1	25†	0	0	0	0	4	50†	Many of the spots small.
10, 3 p. m.	0	0	0	0	0	0	4	55†	Do.
11, 10 a. m.	0	10†	0	0	0	0	4	60†	Do.
12, 4 p. m.	1	3	0	0	1	3	5	60†	Do.
13, 11 a. m.	0	5†	0	0	0	0	5	65†	Do.
14, 9 a. m.	0	0	0	5†	0	0	5	60†	Do.
15, 10 a. m.	1	3	0	15†	0	0	0	40†	
16, 11 a. m.	2	25†	0	10†	1	3	8	55†	
17, 2 p. m.	1	1	0	5†	0	0	8	40†	
18, 11 a. m.	0	20†	1	5†	0	0	7	65†	
19, 5 p. m.	1	2	1	5†	1	2	7	60†	
20, 5 p. m.	0	0	2	5†	0	0	5	55†	
21, 5 p. m.	0	0	0	0	0	0	5	55†	
26, 11 a. m.	2	8	0	0	0	0	5	25†	
28, 4 p. m.	1	25†	1	5†	0	10†	5	45†	
29, 3 p. m.	0	0	1	5†	0	0	4	40†	

Faculae were seen at the time of every observation. †Approximated.

#### DROUGHT.

**Alabama.**—Professor P. H. Mell, jr., director of the "Alabama Weather Service," in his report for September, states: "September has been characterized by a severe drought, which has extended over the entire state. The cotton crop has been greatly damaged, and the late corn, peas, turnips, and all late-planted crops, have been almost totally destroyed. This month has been the driest September for a period of years, not only on account of the slight precipitation, but also because of the small amount of moisture in the air, indicated by the almost total absence of dew at most stations."

**Arkansas.**—Fort Smith: the rain on the 10th ended the drought which had prevailed since August 20th. All kinds of vegetation, and especially the cotton in the upland, were severely injured.

**Connecticut.**—Bridgeport, 23d: but little rain has fallen since September 1st. Garden vegetables and pastures need rain, and many wells are reported dry. In some instances factories have been compelled to suspend work on account of insufficient water-power.

**Hartford, 30th:** during the first eighteen days of the month only 0.05 inch of rain fell at this place.

**District of Columbia.**—Washington City, 30th: since July 29th, when 1.17 inches of rain fell, the rains in this vicinity have been very light, only 1.15 inches having fallen in the two months. The adjacent country presents a dried up and parched appearance. Springs and streams which have never been known to fail have become dry. The leaves are dropping from the trees and the corn in the fields is parched and withered. In this city the shade trees and parks are seriously affected by the drought.

**Georgia.**—Milledgeville, Baldwin county, 30th: no rain fell here during the entire month. All kinds of crops and the pastures have suffered seriously.

**Atlanta, 30th:** severe draught prevailed in this vicinity during the month. No rain, sufficient to lay the dust, has fallen for forty-two days. It is estimated that the cotton crop will fall short forty per cent.

**Illinois.**—Vandalia, Fayette county: a heavy rain, the first of any consequence for more than two months, fell in this section on the 22d. It was of great benefit to pastures; filled the streams, which were very low, and enabled the farmers to seed their autumn wheat, this work having been delayed by the severe drought.

**Champaign, Champaign county:** the rain of the night of



the 23d-24th ended a severe drought which had prevailed for thirty days.

**Indiana.**—Vevay, Switzerland county: the severe drought which prevailed previous to the 11th, was broken by the rain of that date. Before the rain came there was great scarcity of water in the adjacent country, and the farmers were compelled to haul water from the river.

Prof. W. H. Ragan, director of the "Indiana Weather Service" in his report for September, states: "over the greater part of the state the drought continued until near the end of the month, and was then relieved by copious rains."

**Louisiana.**—Shreveport, 16th: reports from neighboring plantations state that in consequence of late planting and the protracted drought of the summer months, not more than two-thirds of an average yield of cotton will be produced.

Grand Coteau, Saint Landry parish, 30th: the rainfall for September was only 0.75 inch. All kinds of crops promise but a poor yield on account of the protracted drought.

**Maryland.**—Fallston, Hartford county, 30th: all kinds of crops have suffered serious injury on account of drought. Owing to the short tomato crop the canning establishments in this vicinity were closed October 1, which is two weeks earlier than the usual time.

**Michigan.**—Thornville, Lapeer county: from the 1st to the 23d the weather was very dry, and wells were lower than they had been for many years. After the above date the rains were abundant.

**New Hampshire.**—Antrim, Hillsborough county, 30th: the total rainfall for the months of July, August, and September is 9.70 inches, which is about two-thirds of the average for the same months during the last twelve years. Many wells in this county have become dry and much inconvenience is experienced on account of scarcity of water.

**New York.**—Cooperstown, Otsego county: the weather during September was unusually dry.

**Ohio.**—Dayton, Montgomery county: the rain on the 24th ended the severest drought in the Miami valley that has been experienced for many years. The rain on the above date was the first that has occurred since August 3d, and came too late to be of benefit to vegetables, which were entirely dried up. Corn and other crops were also injured to a more or less extent.

**Pennsylvania.**—Pittsburg: reports from the western part of Washington county on the 22d stated that cattle and large numbers of sheep were dying on account of drought.

Easton, Northampton county, 30th: the month closed with the continuance of a severe drought. All streams are unusually low, and the roadways are very dry and dusty.

**Rhode Island.**—Providence, 30th: no rain fell here during the first eighteen days of the month.

**Tennessee.**—Nashville, 6th: farmers in the surrounding country report that the crops are suffering in consequence of drought.

Ashland, Maury county, 30th: a severe drought has prevailed for the past two months, during which time only 2.30 inches of rain fell, mostly in light showers. At the close of the month, the springs and streams were drying up.

The following extract is taken from the September report of the "Tennessee Weather Service":

The drought which began in August continued throughout the month of September, with the exception of a few local rains, and affected very greatly the prospects of the various crops.

In many countries it was uninterrupted by even light showers, and, as a consequence, the condition of the growing and maturing crops was lowered to a marked degree. In all three of the grand divisions of the state the reports indicate the drought as almost unprecedented in extent and severity. But few localities escaped the damaging effects by timely showers. The fertile valleys of the east, the highlands and great central basin of the middle division, and the rich plateaus and alluvial lands of the west have all suffered alike. The encouraging prospects of the early part of the summer were swept away before the withering, parching drought. It is doubted that even with copious rains henceforth, much, if any, will be gained to the un-matured crops. In addition to the loss in field products, pastures failed to a great extent, causing live stock to lower in condition; besides, the dryness and hardness of the ground rendered plowing almost impossible, greatly re-

tarding the proper seeding of wheat and delaying it so much that in many of the large wheat-growing counties the area will be very much reduced.

**Texas.**—Salado, Bell county: a heavy rain fell during the night of the 24-25th; previous to this date no rain had fallen since June 18th.

San Antonio: telegraphic dispatches from various points in southwestern Texas on the 25th reported heavy and continuous rains, which were the first that had fallen in four months. The stock interests have suffered heavy losses on account of scarcity of water.

Austin: the rains of the 25th terminated a drought of ninety days' duration. The pastures, streams, wells, and cisterns were dried up, and the Colorado river became so low as to be easily forded. This drought is considered the severest experienced in Texas for many years.

Mexia, Limestone county: on the 25th a fine rain fell in this region, being the first that had fallen for nearly four months. The crops derived no benefit, but the rains replenished the nearly exhausted supply of water for stock.

Elgin, Bastrop county: the long-continued drought in this section was broken by the rains of the 25th; though too late for the crops it will prove of great benefit to late vegetables and pastures.

**Vermont.**—Dorset, Bennington county: September was an unusually warm and dry month. The total rainfall was only 0.85 inch.

**Virginia.**—Petersburg, Dinwiddie county, 28th: the protracted drought has had a damaging effect on all crops in this part of the state. The beds of creeks and streams, in some places, are perfectly dry. The water in the river is so low that the mills have not been able to do half their work. On account of the low stage of water in the reservoir, the citizens have been requested to exercise economy in the use of water.

Johnsontown, Northampton county, 30th: only 0.25 inch of rain has fallen since August 7th. Not more than one half of the average corn crop will be made, and other crops are seriously injured. During the six months ending September 30th, the total rainfall was 9.35 inches, which is 19.15 inches below that for the same months of 1883. At the close of September the ground was found to be perfectly dry to a depth of three feet. The creeks and streams have dried up and many wells have failed for the first time in their history.

Wytheville, Wythe county, 30th: the drought which prevailed during August continued throughout September.

Variety Mills, Nelson county, 30th: the month of September was marked by an almost total absence of rain. Crops have suffered seriously, and the soil is so dry that it cannot be prepared for seeding wheat.

Blacksburg, Montgomery county, 30th: the month has been unusually dry; light showers fell on the 29th and 30th.

Norfolk, 30th: The unusually warm and dry weather during September has caused heavy losses to the farmers in this part of the state. Creeks and streams have become dry, and there is an insufficient supply of water for stock.

Fort Myer, Fairfax county: severe drought prevailed throughout the month.

**West Virginia.**—Helvetia, Randolph county, 30th: severe drought prevailed during September, the total rainfall being only 0.92 inch. At the close of the month the pastures were so dry that cattle were being fed with the winter hay.

#### EARTHQUAKES.

On the afternoon of Friday, September 19th, an earthquake shock occurred, which was felt throughout Ohio, in western Ontario, over the eastern portions of Michigan and Indiana and in northern Kentucky. The region effected in the last-named state, extended along the Ohio river from Newport to Louisville. Reports from La Crosse, Wisconsin, Dubuque, and Cedar Rapids, Iowa, state that earthquake shocks were also felt at those points, the time about corresponding to that at which the shock occurred in the states before mentioned. Several newspapers state that a shock was felt at Beaver Dam, Penn-

sylvania, while others give an identical report from a place of the same name in Indiana. Beaver Dam, Kosciusko county, Indiana, is situated in the northeastern part of the state, and not considering the reports from La Crosse, Dubuque, and Cedar Rapids, it is one of the most westerly stations reporting the shock. If the shock was felt at Beaver Dam, Erie county, Pennsylvania, that place would be the easternmost point from which authentic reports of the shock have been received. It was, however, perceptibly felt at Leetsdale, Allegheny county, Pennsylvania. The most northerly point at which the shock was felt is Alpena, Michigan, the most southerly stations are situated on either side of the Ohio river, from Parkersburg, West Virginia, to Louisville, Kentucky.

Professor Gustavus Hinrichs, director of the "Iowa Weather Service," in his September report, states the following: "The earthquake on the afternoon of the 19th, extending from Ohio to Illinois, was slightly felt at Dubuque and Cedar Rapids in this state."

Reports relating to the earthquake referred to above, arranged by states, are as follows:

**Indiana.**—Indianapolis: at 2.30 p. m. (local time) on the 19th, a slight shock of earthquake was felt in this city. The shock was most noticeable in the upper portions of high buildings. In one instance a chandelier was broken by the motion of the building.

Muncie, Delaware county: an earthquake shock was distinctly felt here at 2.30 p. m. on the 19th. It was accompanied by a loud rumbling sound, and caused buildings to shake.

Auburn, De Kalb county: quite a heavy shock of earthquake was felt here at 2.15 p. m. on the 19th. Buildings were perceptibly shaken from east to west; the shock lasted about ten seconds.

Lawrenceburg, Dearborn county: shortly before 3 p. m., on the 19th, a severe shock of earthquake was felt at this place. The court-house, a massive stone building, was violently shaken, the chandeliers swaying back and forth for several seconds. The school building was more severely shaken than the court-house. In one of the rooms of the former a clock was thrown to the floor, and the teachers and pupils were frightened from the building. The duration of the shock is variously estimated at less than thirty seconds.

Greensburg, Decatur county: at about 2.30 p. m., on the 29th, a slight earthquake was felt here. It was more distinctly felt by persons inside of buildings; there were three separate shocks following in quick succession and lasting for several seconds.

Wabash, Wabash county: shortly before 3 p. m., on the 19th, quite a severe earthquake shock, lasting five seconds, was felt in this locality.

Shelbyville, Shelby county: at 2.15 p. m. (central standard time), on the 19th, a slight shock of earthquake was felt here. The tremor was most noticeable in the upper stories of buildings, and was scarcely noticed by pedestrians. The duration of the shock was about three seconds.

Portland, Jay county: the earthquake of the 19th was felt at this place, the shock being very slight. It was also felt at Red Key, in this county.

Albany, Delaware county: the earthquake on the 19th caused large buildings to shake very perceptibly.

Hagerstown, Wayne county: a light, but very perceptible earthquake shock was felt in this vicinity on the afternoon of the 19th. It was also sensibly felt at Rushville in Rush county.

Seymour, Jackson county: a very slight shock of earthquake occurred about 3 p. m. on the 19th.

Greenfield, Hancock county: a slight earthquake shock was felt throughout this county at 2.20 p. m. on the 19th.

Elkhart, Elkhart county: an earthquake shock was distinctly felt here on the afternoon of the 19th.

Metamora, Franklin county: at 2.15 p. m. (standard time) on the 19th a perceptible shaking of the earth, accompanied by a rumbling noise, was felt in this vicinity.

Milan, Ripley county: quite a heavy shock of earthquake

was felt here and at North Milan, two miles above this place, at about 2 p. m. on the 19th. It was also felt at Sunman in this county.

Liberty, Union county: at 2.22 p. m. on the 19th two earthquake shocks, lasting several minutes, were felt here.

Richmond, Wayne county: the earthquake on the afternoon of the 19th was noticeable throughout the town.

Connersville, Fayette county: about 2.45 p. m. on the 19th a very distinct shock of earthquake was felt in this town. The oscillations continued ten seconds. Pictures, chandeliers, etc., were observed to swing back and forth.

Fort Wayne, Allen county: a slight shock of earthquake, lasting about twenty seconds, was felt about 3 p. m. on the 19th. It was more perceptibly felt in the larger buildings than in the smaller ones, and considerable alarm was caused among the pupils in the schools.

At Winchester, Randolph county, a car on a side track of the Grand Rapids and Indiana Railroad was set in motion by the disturbance.

The following communication has been received from Professor Boerner, of Vevay, Indiana:

VEVAY, IND., September 22, 1884.

The CHIEF SIGNAL OFFICER U. S. ARMY,

Washington, D. C.

SIR: I have the honor to transmit to you the report of an earthquake, and its attendant phenomena, as experienced at this station.

Sept. 19th, 2.30 p. m.: a moderate shock of earthquake was felt in this vicinity; while the vibration was not of great intensity, still, many of our people became highly alarmed. The shock was not very perceptible, beyond the rattling of windows and weights of window sashes inside their casings, the jarring of dishes in pantries, the oscillations of hanging lamps; and many persons did not notice the disturbance at all. I have endeavored to obtain the experience of different persons: some lying on beds distinctly felt the tremor and hastily arose, in great fright, while others, walking on the streets, felt a sensation of unsteadiness. The direction of the disturbance was from north to south, with a duration of 3 seconds; it was preceded by a barometric depression of .09 inch and followed by an increased pressure of .02 inch.

Time.	Barometer corrected for temp.	Thermometer.		Tension of vapor.	Rel. hum.	Clouds.	Wind.
		Dry bulb.	Wet bulb.				
		°	°	Inches.	Per cent.		
7 a. m.	29.72	50	48	.296	79	dense fog	nw. (2)
2 p. m.	29.63	76	64	.435	48	5 cir. cu., sw.	ne. (2)
2.35 p. m.	29.65	76	64	.436	48	5 cir. st., sw.	ne. (2)
9 p. m.	29.65	67	62	.452	74	5 cu. st., w.	ne. (1)

Very respectfully, your obedient servant,

CHAS. G. BOERNER, Observer.

**Iowa.**—Cedar Rapids, Linn county: at about 2 p. m. on the 19th the door of the composing room in the "Republican" office swung open. The building trembled, and papers on a table were thrown to the floor. The disturbance was supposed to have been due to an earthquake.

Dubuque: an earthquake is reported to have been felt by the printers in the upper portion of the "Herald" office at 2.05 p. m. on the 19th. The building was perceptibly shaken.

**Kentucky.**—Louisville: the Signal Service observer reports that two slight shocks of earthquake, of about ten seconds duration, were felt in some portions of the city at about 2.15 p. m. on the 19th. The shocks were noticed by but few people, and were not perceptible at the signal office. Persons who observed the shocks state that the direction of movement was from e. to w., or from ne. to sw.

Covington, Kenton county: the earthquake of the 19th was felt at this place, but the shock was very slight. It is also reported to have been felt in Newport, opposite Covington.

**Michigan.**—Bay City, Bay county: a slight earthquake shock occurred here at 2.45 p. m. on the 19th.

Ypsilanti, Washtenaw county: a severe earthquake shock was felt here on the afternoon of the 19th.

Thornville, Lapeer county: two distinct earthquake shocks occurred on the afternoon of the 19th, the motion being from north to south.



Swartz Creek, Genesee county: an earthquake shock was felt in this vicinity at 2.30 p. m. on the 19th.

Port Huron: a slight shock of earthquake was felt on the afternoon of the 19th.

Adrian, Lenawee county: at 2.30 p. m. of the 19th, a strong earthquake shock, lasting nearly one minute, was felt. It was preceded by a rumbling noise, and caused windows, furniture, etc., to rattle.

East Saginaw, Saginaw county: a distinct earthquake shock was felt at 2.35 p. m. (local time) on the 19th. Buildings were violently shaken, and furniture, etc., displaced; many persons were frightened from their houses and ran into the streets.

Ann Arbor, Washtenaw county: an earthquake shock, lasting from five to eight seconds, occurred at 2.36 p. m. on the 19th. Buildings trembled, windows rattled, and chandeliers and tables were perceptibly shaken. The shock was also felt at Chelsea, in this county.

Detroit: at 2.41 p. m., (local time), of the 19th, an earthquake shock was felt in all parts of this city. The duration of the shock was about twenty seconds. In some localities the shock was more perceptible than in others, being especially noticeable in the higher buildings. Captains of steamers state that there was a noticeable rise in the river at the time the shock occurred.

Lansing, Ingham county: at about 3 p. m., on the 19th, this city and vicinity were perceptibly shaken by an earthquake. The large capitol building trembled noticeably.

Grass Lake, Jackson county: an earthquake shock was felt here on the afternoon of the 19th.

Ohio.—Medina, Medina county: a slight shock of earthquake was felt here at 3 p. m., of the 19th.

Elgin, Lorain county: two shocks of earthquake were felt at 2.50 p. m., on the 19th. They occurred in quick succession, the second being the heavier.

Paulding, Paulding county: at 2.15 p. m. on the 19th, a severe earthquake shock was felt.

Zanesville, Muskingum county: at about 2.45 p. m. on the 19th, two earthquake shocks, lasting ten seconds, were distinctly felt.

Xenia, Green county: at 3 p. m. on the 19th, two distinct shocks of earthquake were perceptibly felt throughout the town.

Ottawa, Putnam county: considerable excitement was caused by an earthquake shock at 3 p. m. on the 19th, it lasted nearly one minute.

Mount Gilead, Morrow county: three distinct earthquake shocks occurred on the afternoon of the 19th.

Lancaster, Fairfield county: a very perceptible shock of earthquake was felt here and in the neighboring towns at about 3 p. m. on the 19th.

Wilmington, Clinton county: an earthquake shock was felt at about 2.45 p. m. on the 19th; the vibration was from east to west.

Ansonia, Crawford county: at about 2.30 p. m. on the 19th, an earthquake shock occurred, which shook buildings violently. It was also felt at Crestline, in this county.

Bellefontaine, Logan county: a heavy shock of earthquake was felt here at 3 p. m. on the 19th. Three distinct vibrations were felt, accompanied by a heavy rumbling sound.

Findlay, Hancock county: a light earthquake shock occurred at 2.55 p. m. on the 19th. It continued about fifteen seconds, causing buildings to shake, and upsetting insecure articles.

Cumberland, Guernsey county: at about 4 p. m. on the 19th, a distinct shock of earthquake occurred, lasting about thirty seconds; the motion was apparently from east to west.

Caledonia, Marion county: the earthquake shock of the 19th was felt at 2.45 p. m., and lasted about five seconds. Buildings were violently shaken.

Lima, Allen county: the earthquake of the 19th was felt about 3 p. m. It was of considerable violence, and caused much excitement.

Maryville, Union county: about 3 p. m. of the 19th, a perceptible shock of earthquake occurred, lasting fifteen seconds.

Newark, Licking county: at 2.42 p. m. (local time), on the 19th, several earthquake shocks of considerable violence were felt here.

Urbana, Champaign county: at about 3.30 p. m. on the 19th an earthquake shock was sensibly felt at this place. Buildings were considerably shaken and furniture, etc., displaced.

Bryan, Williams county: a few minutes before 3 p. m. on the 19th an earthquake shock, accompanied by a low, rumbling noise, occurred at this place. The shock lasted for several seconds. The larger buildings in the town were considerably shaken.

Mount Vernon, Knox county: at 3.20 p. m. an earthquake shock, lasting about ten seconds, was distinctly felt. The shock was much stronger in the northern part of the town, and caused considerable alarm among the pupils at the Union school building.

Troy, Miami county: at 2.40 p. m. on the 19th two distinct shocks of earthquake were felt here. The shocks were most noticeable in the upper stories of buildings, being unnoticed by many persons on the streets.

Marietta, Washington county: the earthquake shock on the afternoon of the 19th was felt at this place and in surrounding localities.

Fremont, Sandusky county: an earthquake shock of several seconds duration was felt here at 2.45 p. m. on the 19th.

Tiffin, Seneca county: a slight shock of earthquake was felt in the southern part of this town at 2.45 p. m. on the 19th.

Akron, Summit county: two distinct shocks of earthquake were felt here at 2.40 p. m. on the 19th.

Archbold, Fulton county: at 2.13 p. m. (standard time) on the 19th, an earthquake shock was felt, lasting about twenty seconds, and causing buildings to shake.

Postoria, Seneca county: a slight earthquake shock was felt at 2.19 p. m. on the 19th.

Defiance, Defiance county: at a few minutes before 3 p. m. on the 19th a perceptible shock of earthquake was felt at this place and in the surrounding country.

Dayton, Montgomery county: an earthquake shock occurred at about 3.30 p. m. on the 19th; it was distinctly felt in buildings of two and three stories. A rumbling noise was heard throughout the city.

Massillon, Stark county: an earthquake shock occurred at about 3.15 p. m. on the 19th. It was most distinctly felt in the larger buildings; in some instances considerable alarm was caused.

At Cecil, Paulding county: the goods in the stores were thrown from the shelving.

Toledo: an earthquake shock lasting fifteen seconds was distinctly felt at 2.42 p. m. (local time), on the 19th.

Coshocton, Coshocton county: on the 19th at 2.15 p. m. (standard time), a distinct shock of earthquake was felt. The vibrations were quite perceptible in several large buildings.

Cincinnati: two distinct shocks of earthquake were felt in this city at 2.37 p. m. (local time) of the 19th. The vibrations were most perceptible in tall buildings and on the neighboring hills, the motion being apparently from south to north, and lasting from two to three seconds. In some of the suburbs the shock was more severe than in the city. In Clifton the disturbance caused the door-bells to ring. At Cummins ville, the shock caused considerable alarm.

Cleveland: at 2.47 p. m. (local time) on the 19th, three distinct shocks of earthquake were felt. The direction of the vibrations was from west to east, the duration being about five seconds. The first was the most noticeable and of the longest duration. In some parts of the city the shocks were scarcely noticeable, while in others the disturbance was sufficient to displace furniture, etc., and to cause chandeliers to vibrate.

Columbus: the Signal Service observer reports that at 2.42 p. m. (local time) of the 19th, an earthquake occurred. Chandeliers were observed to sway from north to south, the motion

continuing for at least two minutes after the occurrence of the shock. It was most noticeable in the upper stories of the larger buildings, and many persons on the streets at the time the shock occurred did not notice it. Some observers state that a rumbling noise preceded the shock.

Canton, Stark county: a few minutes before 3 p. m. on the afternoon of the 19th, a slight shock of earthquake was felt. The walls of several buildings moved perceptibly.

Greenville, Darke county: the earthquake of the 19th was felt here about 4 p. m. and was generally observed. The shock was also felt at Ansonia, in this county.

Frederickstown, Knox county: an earthquake shock, lasting about thirty seconds, was distinctly felt at 2.40 p. m. on the 19th.

Millersburg, Holmes county: much excitement was caused by the earthquake shock which occurred at 3 p. m. on the 19th. Windows rattled, and crockery, etc., were shaken from their places.

Ontario.—Windsor: quite a heavy shock of earthquake was experienced here at 2.45 p. m. on the 19th.

London: a perceptible shock of earthquake was felt in this city at 3.25 p. m. on the 19th.

Dresden: at 3.20 p. m., on the 19th, a distinct shock of earthquake was felt at this place.

Pennsylvania.—Leetsdale, Allegheny county: two shocks of earthquake were felt here at 2.35 p. m. on the 19th. They were sufficient to cause windows, crockery, etc., to rattle.

West Virginia.—Parkersburg, Wood county: an earthquake shock was distinctly felt for several seconds on the afternoon of the 19th. In the vicinity of the court-house the shock was sufficient to shake plaster from the ceilings.

Wheeling: a slight earthquake shock was felt here at about 2.30 p. m. on the 19th.

The following extract is from "Nature" of September 11, 1884:

At numerous places in lower Austria several shocks of earthquake were felt on Tuesday (September 2). The duration of the shocks was from 4" to 9" each.

The observer at Yuma, Arizona, reports that two shocks of earthquake were felt at that place during the night of the 26-27th. The first shock was felt at 10.53 p. m.; it continued ten seconds, the direction of vibration being from south to north. The second shock was very slight and occurred about 3 a. m.

At New Tacoma, Washington Territory, light shocks of earthquake were felt between 10 and 11 p. m. on the 21st.

#### METEORS.

Yates Centre, Kansas: a brilliant meteor, apparently about the size of "Venus," was observed about 4.30 a. m. on the 1st. It passed slowly from a point about 30° above the southeastern horizon to within 2° of the northeastern horizon, where it separated into two parts and disappeared, leaving a trail which remained visible for five seconds.

Duluth, Minnesota: about 9.30 p. m. on the 13th a brilliant meteor was observed in the northwestern sky at an altitude of 48°; it passed directly through the zenith and disappeared when about 50° above the southeastern horizon; before disappearing it exploded into three parts.

Buffalo, New York: numerous meteors were observed on the 1st. On the 17th, at 10 p. m., a brilliant meteor, of pale blue color, passed across the sky from southeast to northwest.

Salina, Kansas: at 9.20 p. m. of the 24th, a very brilliant meteor appeared in the northern sky, passing westward; it left a bright, bluish light which was visible ten seconds.

Meteors were also observed at the following places:

Wyandotte, Kansas, 1st.

Rowe, Massachusetts, 3d, 4th, 17th.

Clay Center, Kansas, 6th, 24th.

Le Roy, New York, 8th.

Grand Junction, Colorado, 9th.

Woodstock, Maryland, 9th, 10th, 11th, 13th to 18th, 20th, 22d, 23d, 25th, 28th.

Yuma, Arizona, 10th, 13th.

Tecumseh, Nebraska, 11th.

Pittsburg, Pennsylvania, 11th.

Fort Yates, Dakota, 11th, 19th.

Hydesville, California, 12th.

Variety Mills, Virginia, 13th.

Vicksburg, Mississippi, 14th.

Point Pleasant, Louisiana, 14th, 18th.

Humboldt, Iowa, 16th.

Allison, Kansas, 17th, 18th, 19th.

Davenport, Iowa, 17th.

Green Springs, Alabama, 18th.

Raleigh, North Carolina, 18th.

Stateburg, South Carolina, 18th, 29th, 30th.

Menand Station, near Albany, New York, 19th.

Lynchburg, Virginia, 23d.

Red Willow, Nebraska, 27th.

Beloit, Wisconsin, 27th.

Yutan, Nebraska, 28th.

#### WATER SPOUTS.

Professor E. S. Holden, of the Washington Observatory, at Madison, furnishes the following report:

At 3.12 p. m., a severe thunder storm began with extremely high wind. The trees near the fair-grounds were bent far out of the perpendicular, and also were twisted. From 3.12 to 3.35, 0.63 of an inch of rain fell. There was hail at 2.15 p. m., and this was the time of the maximum wind velocity of fifty-four miles per hour. The presence of hail, the high wind, and the twisting of trees, would indicate that a storm of the tornado class was not far distant. In fact, the true tornado was seen to move on to the lake from the University drive, near its west end, and to move towards the northeast, in the form of a water spout, some sixty or eighty feet high, and perhaps twenty feet in diameter. At the base of the spout the water was much agitated. Not far beyond Picnic point, the column broke, leaving a mound of water some ten feet above the general level of the lake for a few instants, after which the tornado rose above the lake surface.

If the storm had moved over the earth, and not over the water it would have shown itself as a true tornado of unusually small dimensions. Its force would have been sufficient to have wrecked any ordinary buildings in its path.

#### PRAIRIE AND FOREST FIRES.

Baltimore, Maryland, 5th: reports from Talbot county state that serious forest fires prevailed along the Choptank river on the 4th and 5th; thousands of acres of woodland were burned over.

Philadelphia, Pennsylvania: the forest fires which prevailed during the week, from 15th to 22d, caused much alarm in the villages of Balston and Pleasant Mills, on the borders of Atlantic and Burlington counties, New Jersey.

Port Huron, Michigan: the forest fires which had prevailed in this vicinity for several days prior to the 16th were, on that date, driven by the high westerly winds to the outskirts of the town, causing great alarm. It required the efforts of the citizens and fire department to keep back the fires.

Bay City, Bay county, Michigan, 18th: a change in the direction of the wind during the night of the 17-18th probably saved the villages of Pinconning and Arenac from destruction by forest fires, which prevailed in the vicinity of these places.

East Tawas, Iosco county, Michigan: during the 17th and 18th telegraphic communication was cut off, the telegraph poles having been burned by forest fires.

East Saginaw, Saginaw county, Michigan, 18th: the Michigan Central railroad bridge at White Feather was destroyed by forest fires on the evening of the 16th. On that date forest fires were prevailing at various points along the shore of Lake Huron from the mouth of the Saginaw river to Alpena.

Petersburg, Dinwiddie county, Virginia: a destructive forest fire was reported from along the line of the Norfolk and Western railroad on the 30th.

Prairie and forest fires were also reported from the following places:

Fort Yates, Dakota, 4th.

Huron, Dakota, 25th.

Fort Sully, Dakota, 19th, 20th.



Meteorological record of voluntary observers and army post surgeons—September, 1884.

Temperature				Temperature				Temperature				Temperature							
District and station.				District and station.				District and station.				District and station.							
Mean.	Maximum.	Minimum.	Rainfall.	Mean.	Maximum.	Minimum.	Rainfall.	Mean.	Maximum.	Minimum.	Rainfall.	Mean.	Maximum.	Minimum.	Rainfall.				
New England.																			
Hartford, Conn.	65.2	94	33	0.79	Great Falls, Md.	70.8	96	46	0.22	Margaretta, Ohio.	60.6	90	46	3.38	Pierce City, Mo.	72.9	95	53	7.39
Bethel, Conn.	88	88	30	1.07	West Washington, D. C.	70.8	96	46	0.22	Hiram, Ohio.	67.3	91	49	4.25	Greenfield, Mo.	72.9	95	53	7.39
Orono, Me.	58.9	88	30	2.19	Wytheville, Va.	64.6	86	42	0.60	Cleveland, Ohio.	67.3	91	49	4.25	Atchison, Kans.	72.0	92	49	5.99
Cornish, Me.	61.7	90	36	1.39	Factoryville, N. Y.	64.0	92	38	1.74	North Lewisburg, Ohio.	71.0	95	37	7.60	Harrisonville, Mo.	72.0	92	49	5.99
Amherst, Mass.	64.4	90	39	1.25	White Plains, N. Y.	67.9	85	48	1.12	Wauseon, Ohio.	67.8	95	30	1.85	Manhattan, Kans.	72.0	92	49	5.99
Dudley, Mass.	63.4	93	42	1.06	Salem, N. J.	67.9	85	48	1.12	Palermo, N. Y.	62.0	92	34	1.91	Independence, Kans.	73.0	94	53	9.71
Mendon, Mass.	65.7	87	44	0.65	Fort Columbus, N. Y.	70.2	93	50	0.74	Humphrey, N. Y.	64.2	87	39	4.82	Wyandotte, Kans.	68.8	91	46	7.10
Milton, Mass.	62.6	86	40	0.65	Fort Monroe, Va.	74.0	89	58	0.16	Ithaca, N. Y.	64.6	90	34	1.72	Fort Scott, Kans.	73.0	94	54	11.45
New Bedford, Mass.	64.4	87	43	0.96	Madison Barracks, N. Y.	64.3	87	30	2.69	Penn Yan, N. Y.	64.6	90	34	1.72	Salina, Kans.	77.3	86	62	1.04
Somerset, Mass.	67.8	94	39	0.94	Plattsburg B'ks, N. Y.	63.2	92	34	1.69	North Volney, N. Y.	65.5	95	36	2.20	Emporia, Kans.	73.1	94	50	3.15
Princeton, Mass.	62.2	89	40	1.59	David's Island, N. Y. H.	71.2	95	35	0.33	Hudson, Mich.	60.2	95	32	1.72	Sherlock, Kans.	71.3	91	48	1.09
Westborough, Mass.	67.2	96	37	1.13	Fort McHenry, Md.	71.4	92	49	trace	Mount Forest, Ont.	59.5	88	31	2.73	Yates Centre, Kans.	73.9	100	51	5.63
Taunton, Mass.	65.6	97	37	0.53	South Atlantic States.				Fort Niagara, N. Y.	66.1	90	44	0.70	Clay Centre, Kans.	72.5	98	53	6.02	
Fall River, Mass.	61.2	89	45	0.83	Lenoir, N. C.	89	45	0.60	Upper Lake Region.				Westmoreland, Kans.	68.0	94	46	5.75		
Worcester, Mass.	62.1	86	42	0.81	Lincolnton, N. C.	70.6	85	53	0.17	Manitowoc, Wis.	62.7	85	42	1.55	Logan, Iowa	69.1	93	44	5.50
Antrim, N. H.	62.2	86	42	2.70	Raleigh, N. C.	76.0	92	58	7.00	Wausau, Wis.	62.7	85	42	1.55	Webster, Dak.	62.2	93	25	1.48
Weir's Bridge, N. H.	62.2	86	42	0.95	Highlands, N. C.	59.8	78	40	1.40	Ripon, Wis.	62.7	85	42	1.55	Marquette, Nebr.	62.2	93	25	1.48
Lake Village, N. H.	62.2	86	42	0.83	Flat Rock, N. C.	65.8	83	41	3.11	Embarras, Wis.	64.6	85	46	9.40	W. Leavenworth, Kans.	70.0	91	49	7.00
Bristol, N. H.	62.2	86	42	0.52	Statesville, N. C.	75.3	92	55	0.50	Sussex, Wis.	67.6	89	45	2.70	Topeka, Kans.	73.0	94	48	6.85
Ashland, N. H.	62.2	86	42	1.07	Weldon, N. C.	74.7	95	52	0.23	Franklin, Wis.	62.7	85	42	1.55	Guttenberg, Iowa	73.0	94	49	3.50
Woodstock, N. H.	62.2	86	42	1.26	Chapel Hill, N. C.	74.7	95	52	0.23	Beloit, Wis.	66.4	92	42	2.22	Fort Robinson, Nebr.	62.8	94	32	0.50
Belmont, N. H.	62.2	86	42	0.72	Brevard, N. C.	68.0	89	42	0.70	Hilledale, Mich.	66.4	92	42	2.22	Fort Sisseton, Dak.	57.4	86	32	1.43
Wolborough, N. H.	62.2	86	42	1.28	Milledgeville, Ga.	89	51	0.60	Swartz Creek, Mich.	64.8	91	36	2.01	Fort Sully, Dak.	64.2	96	35	0.76	
Providence, R. I.	66.8	92	39	1.41	Athens, Ga.	74.8	92	45	0.01	Ionia, Mich.	64.3	92	35	3.26	Rocky Mountain Slopes.				
Charlotte, Vt.	69.0	92	40	3.00	Stateburg, S. C.	72.0	89	55	6.67	Marshall, Mich.	64.3	92	35	3.26	Red Willow, Nebr.	60.0	96	34	0.12
Burlington, Vt.	65.2	91	36	3.22	Florida Peninsula.				Northport, Mich.	64.3	92	35	3.26	Stockham, Nebr.	77.3	90	64	1.70	
Woodstock, Vt.	65.2	91	36	3.22	Archer, Fla.	77.7	89	65	1.95	Mendon, Mich.	62.8	88	35	6.63	Maud, Kans.	76.9	96	50	0.19
Dorset, Vt.	61.3	87	32	0.85	Mayport, Fla.	80.1	72	90	5.55	Traverse City, Mich.	62.8	88	35	6.63	Wellington, Kans.	74.5	100	47	1.10
Lunenburg, Vt.	58.4	84	35	2.65	Tallahassee, Fla.	80.1	72	90	5.55	Kalamazoo, Mich.	62.8	88	35	6.63	Allison, Kans.	66.5	97	32	0.65
Newport, Vt.	61.9	90	30	3.32	Limona, Fla.	79.3	89	66	3.75	Thornville, Mich.	72.1	92	43	3.30	Pueblo, Colo.	66.2	89	44	0.40
Stratford, Vt.	62.9	86	32	0.70	Saint Augustine, Fla.	79.3	89	66	3.75	Mendon, Mich.	62.8	88	35	6.63	Tucson, Ariz.	66.2	89	44	0.40
Rowe, Mass.	60.9	87	40	0.95	Eastern Gulf States.				Fort Wayne, Ind.	69.5	98	44	2.25	Fort McDowell, Ariz.	77.6	103	51	3.11	
Williamstown, Mass.	60.9	87	40	0.95	Green Springs, Ala.	76.2	93	57	1.25	Logansport, Ind.	70.4	96	43	2.29	Fort Lewis, Colo.	52.9	75	23	1.15
Gardiner, Me.	59.8	83	34	2.11	Luling, La.	75.0	93	59	3.84	Sycamore, Ill.	64.8	88	45	3.49	Fort Concho, Tex.	60.8	101	63	3.64
Middle Atlantic States.																			
Dale Enterprise, Va.	70.8	97	42	1.32	Forsyth, Ga.	82.2	90	52	1.60	Marengo, Ill.	65.2	90	45	4.34	Fort Fred Steele, Wyo.	55.4	87	26	0.24
Wytheville, Va.	65.5	86	38	1.74	Fort Barrancas, Fla.	89	75	10.75	Sandwich, Ill.	69.9	96	50	2.55	Fort Randall, Dak.	65.3	97	36	0.34	
Variety Mills, Va.	68.9	95	39	0.04	Mt. Vernon B'ks, Ala.	50.3	97	57	1.15	Wilton Centre, Ill.	66.1	92	43	3.62	Fort A. Lincoln, Dak.	57.2	82	30	2.30
Accotink, Va.	72.6	95	45	trace	Western Gulf States.				Lansing, Mich.	68.0	93	43	2.71	Fort Keogh, Mont.	54.7	86	24	0.46	
Blacksburg, Va.	72.6	95	45	trace	Cleburne, Tex.	81.1	96	66	1.00	Fort Brady, Mich.	57.7	88	33	7.00	Fort Ellis, Mont.	47.8	85	25	4.05
Summit, Va.	72.6	95	45	trace	New Ulm, Tex.	80.0	83	74	5.18	Extreme Northwest.				Fort Union, N. Mex.	60.6	82	33	1.08	
Johnston, Va.	76.8	92	59	trace	Clarksville, Tex.	80.1	95	62	1.03	Richardson, Dak.	59.0	90	29	1.94	Fort Shaw, Mont.	50.1	82	21	2.29
Wellsborough, Pa.	63.5	92	36	3.20	Austin, Tex.	83.2	94	71	1.70	Fort Yates, Dak.	59.0	90	29	1.94	Fort Meade, Dak.	55.3	83	20	0.23
Fallington, Pa.	69.6	92	48	0.22	Grand Coteau, La.	81.3	93	63	0.75	Fort Buford, Dak.	52.7	82	24	0.18	Fort Assinaboine, Mont.	51.7	80	21	2.74
Quakertown, Pa.	69.6	92	48	0.22	Liberty Hill, La.	82	92	82	0.75	Fort Totten, Dak.	55.4	88	34	1.98	Fort Lyon, Colo.	69.5	95	27	0.20
Quakertown, Pa.	69.6	92	48	0.22	Mount Ida, Ark.	75.5	95	52	2.65	Upper Mississippi Valley.				Plateau Districts.					
Drifton, Pa.	63.1	91	37	2.50	Lead Hill, Ark.	70.4	103	51	5.14	Neillsville, Wis.	65.1	86	47	4.25	Carson City, Nev.	55.8	88	28	0.22
Troy, Pa.	63.0	91	27	0.77	Fayetteville, Ark.	92	92	53	4.92	Lancaster, Wis.	65.1	86	47	4.25	Grand Junction, Colo.	53.5	95	38	0.18
Easton (Lafayette Col.), Pa.	71.4	98	40	2.53	Point Pleasant, La.	77.3	96	61	0.14	Madison, Wis.	65.1	86	47	4.25	Puerto de Luna, N. Mex.	54.8	85	28	1.70
Dyberry, Pa.	60.8	90	31	2.53	Rio Grande Valley.				Prairie du Chien, Wis.	66.3	90	46	5.41	Nephi, Utah.	54.8	85	28	1.70	
Catawissa, Pa.	67.2	93	43	2.66	Fort Brown, Tex.	82.0	96	69	7.50	Northfield, Minn.	61.6	90	41	5.51	Fort McDermitt, Nev.	51.4	86	32	1.69
Westchester, Pa.	68.6	93	43	4.42	Ohio Valley and Tennessee.				Minneapolis, Minn.	61.6	87	47	5.27	Fort Bridger, Wyo.	48.9	78	19	0.74	
Easton, Pa.	68.6	93	43	4.42	Wellsburg, W. Va.				Chester, Minn.	93	35	6.20	Fort Wingate, N. Mex.	62.2	81	30	0.76		
Germantown, Pa.	92	48	0.14	Helvetia, W. Va.	63.3	92	40	0.92	Monticello, Iowa.	66.6	90	30	6.80	Pacific Slope.					
Tamaqua, Pa.	72.0	98	53	1.30	Marion, Va.	69.0	89	42	0.03	Des Moines (near) Iowa.	67.9	89	46	10.90	Poway, Cal.				
Chambersburg, Pa.	66.6	93	39	0.89	Milan, Tenn.	73.8	97	50	4.95	Independence, Iowa.	64.0	84	48	10.90	Cahuenga Valley, Cal.				
Hulmeville, Pa.	66.6	93	39	0.89	Austin, Tenn.	75.8	92	52	1.51	Ottumwa, Iowa.	68.6	85	42	2.89	Princeton, Cal.	67.4	97	45	1.13
Haverford College, Pa.	90	42	0.20	Estill, Tenn.					Manchester, Iowa.	68.0	94	45	7.25	Salinas, Cal.	57.0	75	45	0.11	
State College, Pa.					Grampan Hills, Pa.	66.0	94	36	2.14	Indianola, Iowa.					Oakland, Cal.	59.4	76	47	0.35
Mountainville, N. Y.	65.5	94	35	0.98	Leedsdale, Pa.					Cresco, Iowa.	63.3	89	40	3.18	Hydesville, Cal.	57.6	76	42	1.02
Auburn, N. Y.	64.5	86	37	3.55	Jacksonburg, Ohio.					Fort Madison, Iowa.	61.4	90	34	5.66	College City, Cal.	67.0	94	48	0.36
Menand, N. Y.	66.1	88	40	1.57	Westerville, Ohio.	66.8	91	36	4.91	Muscatine, Iowa.	67.3	94	41	5.23	Sacramento, Cal.	67.0	94	48	0.36
Leroy, N. Y.	62.4	95	34	2.22	College Hill, Ohio.	73.6	98	52	4.38	Maynard, Iowa.	61.4	90	34	5.66	San Rafael, Cal.				
Cooperstown, N. Y.	61.6	87	30	1.29	Portsmouth, Ohio.	69.3	92	44	1.87	Humboldt, Iowa.	62.8	89	44	5.66	Eola, Oreg.	52.3	68	40	6.59
Port Jervis, N. Y.	62.9	88	42	1.15	Frankfort, Ky.	71.4	90	50	6.07	Peoria, Ill.	73.3	94	50	5.76	Albany, Oreg.	53.3	74	44	5.61
Phillipsburg, N. J.	69.9	90	49	0.41	Richmond, Ky.	71.6	90	57	3.90	Collinsville, Ill.	72.3	94	49	3.66	East Portland, Oreg.	70	42	3.08	
Somerville, N. J.	69.6	94	46	0.26	Lafayette, Ind.	68.8	91	36	2.43	Bunker Hill, Ill.	71.4	100	44	7.19	Pleasant Grove, Wash. T.	75	22	0.33	
Caldwell, N. J.	73.9																		

Fort Union, New Mexico, 7th.  
Cleburne, Texas, 4th.

## ZODIACAL LIGHT.

Fall River, Massachusetts, 9th.  
Northport, Michigan, 13th.  
Escanaba, Michigan, 20th, 24th, 25th.  
Nashville, Tennessee, 12th, 13th, 14th.  
Dale Enterprise, Virginia, 25th.

## MIGRATION OF BIRDS.

*Geese flying southward.*—Sacramento, California, 3d, 22d; Keokuk, Iowa, 7th, 10th, 30th; Cantonment, Indian Territory, 11th; Salinas City, Kansas, 22d; Portland, Oregon, 12th, 14th; Sterling, Kansas, 21st; Red Willow, Nebraska, 20th, 21st; Thatcher's Island, Massachusetts, 19th; Narragansett Pier, Rhode Island, 4th; Fort Yates, Dakota, 21st; Davenport, Iowa, 10th, 18th, 27th; Cape Henry, Virginia, 21st, 24th; Chincoteague, Virginia, 20th, 23d; Fort Buford, Dakota, 25th; Saint Paul, Minnesota, 27th; Des Moines, Iowa, 30th.

*Ducks flying southward.*—Allison, Kansas, 13th, 30th; Liberty Hill, Louisiana, 24th; Savannah, Georgia, 26th; Des Moines, Iowa, 30th.

*Cranes flying southward.*—Fort Buford, Dakota, 19th.

## ERRATUM.

On page 116 of the July REVIEW, under "frosts," that reported as having occurred at Blue Lake, California, should read Christmas Prairie, the latter place being about fourteen miles distant, and nearly 3,000 feet above the level of Blue Lake, which is the post-office address of the observer.

## NOTES AND EXTRACTS.

## IOWA WEATHER BULLETIN FOR SEPTEMBER, 1884.

September, 1884, was very warm, fair, and rather dry, southerly winds largely prevailing.

The mean temperature of the air was over five degrees above normal, and almost equal to the mean temperature of August just preceding. During the past forty-five years September has but once been decidedly warmer, namely, in 1865, and only three times has it been as warm as this year, namely, in 1881, 1854, and 1851. The first decade was extraordinarily warm, exceeding the normal by over nine degrees and completing the ripening of our corn; the second decade was only half a degree above normal, but remarkably clear and fine, the mean insolation at noon being over fifty degrees in excess of the temperature of the air; finally, the third decade was again very warm, nearly six degrees above normal.

No frost, sufficient to hurt vegetation, has yet occurred in our state this fall. During the clear nights of the middle decade, a faint hoar frost has been reported from a few localities in northern and central Iowa as having been seen on low grounds, but not even tender vines have been damaged. The coldest morning was that of the 25th, when very slight hoar frost was seen in northeastern Iowa. It is now five and a half months since the last spring frosts, while last year less than three and a half months intervened between the last severe spring frosts and the first killing frost in fall.

The rainfall has been of nearly normal frequency, but below normal in amount; it occurred till the close of the month, mainly in showers of short duration, hardly hindering field work and leaving the roads in fair condition.

The only heavy rains of the month occurred on the 8th and 9th in northwestern Iowa, with over six inches of rainfall at Sibley, and on the 23d from Kossuth to Story county, with about four inches of rainfall at Algona and Ames.

The storm of the afternoon of the 9th was the most severe of the month, but mainly limited to the northwest, in Iowa, where a small tornado destroyed several farm buildings at Perry Valley, Plymouth county, while extended and destructive tornadoes raged in Dakota, Minnesota, and Wisconsin. The immunity of Iowa from tornadoes between July 4th and October 8th, resulting from previous records, is not essentially disturbed by the slight whirlwind mentioned, except that in the northwestern district of Iowa, between Dakota and Minnesota, minor whirlwinds may occur during severe storms in the states named.

The earthquake of the afternoon of the 19th, extending from Ohio to Illinois, was slightly felt at Dubuque and Cedar Rapids, in this state.

The season just closed has been remarkably favorable for Iowa.

GUSTAVUS HINRICHS.

CENTRAL STATION, I. W. S., October 1, 1884.

## REPORT OF THE ALABAMA WEATHER SERVICE.

## AGRICULTURAL AND MECHANICAL COLLEGE.

Auburn, Alabama, October 1, 1884.

September has been characterized by a severe drought, which has extended

over the entire state. The cotton crop has been greatly damaged, and the late corn, peas, turnips, and all late-planted crops, have been almost totally destroyed. This month has been the driest September for a period of years, not only account of the slight precipitation, but also because of the small amount of moisture in the air, indicated by the almost total absence of dew at most stations. The stations reporting the relative humidity give an average of 68.7 per cent. of moisture. The rainfall was below the average 1.83 inches. However, the great number of fair days enabled the farmers to pick out the cotton that opened so rapidly under the heat of the sun, and but little, if any, of the staple has been lost. In the middle and lower portions of the state the streams have been so low that the gins run by water power have found it difficult to keep in advance of the cotton pickers.

The average temperature was above the normal 3°. The days have been uniformly hot, but the nights have been cool and pleasant.

The conditions of the atmosphere have been unfavorable to health, and accordingly, many sections complain of an unusual amount of sickness.

## SUMMARY.

Mean temperature, 77°.6; highest temperature, 97° at Montgomery on the 12th, and 97° at Calera on the 29th; lowest temperature, 45° at Calera on the 16th; range of temperature, 52°; greatest monthly range of temperature, 48° at Gadsden, and 52° at Calera; least monthly range of temperature, 18° at Summerville, and 33° at Mobile; greatest daily range of temperature, 38° at Gadsden on the 17th, and 39° at Scottsboro on the 29th; least daily range of temperature, 2° at Dadeville on the 2d, and 6° at Birmingham on the 1st.

Mean depth of rainfall, 0.40 inch; mean daily rainfall, 0.013 inch; greatest depth of monthly rainfall, 2.00 inches at Chattanooga, 1.78 inches at Mobile, and 1.25 inches at Greene Springs; least depth of monthly rainfall, 0.00 inches at Calera, Evergreen, Fort Deposit, Prattville, Selma, Troy, Tuscaloosa, and Wetumpka; greatest daily rainfall, average for the state, 0.12 inch on the 6th; heaviest daily rainfall, 1.13 inches at Green Springs on the 6th.

Average number of days on which rain fell, 2; average number of cloudy days, 3; average number of fair days, 15; average number of clear days, 12; warmest day, 12th; coolest days, 15th, 16th, and 17th.

Prevailing direction of wind, southeast and east.

Greatest force of wind: Chattanooga reports 20 miles an hour on the 22d; Mobile reports 24 miles an hour from the southeast; Montgomery reports 16 miles an hour from the southeast and northeast.

The following extract is from the September report of the Nebraska Weather Service, under direction of Professor Goodwin D. Swezey:

BOSWELL OBSERVATORY, DOANE COLLEGE,  
Crete, Nebraska.

The Nebraska Weather Service has now forty-five stations, covering the state from north to south and as far west as North Platte and Red Willow.

As will be seen by the following data, the weather has been warm, with about the usual number of storms and amount of rain, and in no respect a marked month.

## Comparison of September, 1884, with September, 1883.

	1883.	1884.
Mean temperature.....	66.7	67.2
Noon.....	70.7	70.2
Rain, in inches.....	3.4	3.0
Rainy days.....	7.2	5.9
Fog.....	1.4	2.1
Hail-storms.....	1.2	2.0
Thunder-storms.....	3.5	5.2
Cloudy days.....	6.4	7.0
Clear days.....	13.9	18.4
Temperature above 85°.....	2.0	6.6
Temperature below 32°.....	1.9	1.2

## REPORT OF THE MISSOURI WEATHER SERVICE, SEPTEMBER, 1884.

September has been unusually warm, with excess of rainfall. The monthly temperature during September was 74°.7 at the central station, which has been exceeded but three times since 1837, viz., 76°.0, in 1854; 74°.9, in 1865, and 76°.2, in 1881.

The warmest temperature during the last month, at the central station, was 92°.5, a temperature which is often reached in September. Engelmann has observed a temperature of 102° in the Septembers of 1850 and 1863, and at some time during the last forty-seven years he has observed temperatures of 90° or over on each day of September, excepting only the 15th and 27th, on which days the temperature has never risen above 88°. Temperatures of 100° or over have been observed four times, viz., in 1850, 102°, on the 2d; in 1863, 102°, on the 3d; in 1868, 100°, on the 4th; in 1859, 100°, on the 5th. The temperature has never risen above 90° after the 2d of October.

The lowest minimum observed during last month was 55°.0, which has never been observed so high before.

The highest temperatures reported are 96°, at Dresden; and 94° at Sedalia, Phelps City, and Greenfield. At Mascoutah, Illinois, the temperature reached 97°; Mascoutah also reports the highest average, viz., 75°.7. The central station coming next with 74°.7.

The maximum rainfall of over 13 inches occurred at Dresden, Pettis



county; Sedalia reporting 10.54. From this point the amount diminishes in all directions, being five to seven inches in central-eastern and central-western Missouri, and about two inches in the northwestern and southeastern portions of the state. The normal rainfall for Saint Louis is three inches, and the greatest observed September rainfall was 10.53, in 1866.

The following notes are contributed by observers:

Phelps City, corn good and out of danger from frost; Chamois, corn crop as fine as I ever saw grow; Louisiana, too wet for farmers, wheat sowing backward, apple crop large but much of the fruit defective; Glasgow, first part of the month dry but latter part very wet. About seven inches of rain fell during the last decade, delaying wheat sowing and tobacco cutting. No frost during the month; Louisiana, 8th and 9th, afterglow at sunset fine, fan-like rays of red shot up towards the zenith; Mexico, 9th, after sunset at 19.15 sky showed alternate large rays of gold and pale olive green; Centreville, 3d, after sunset and before sunrise for several days the western and eastern sky shows a peculiar, coppery red; Chamois, 8th and 9th, beautiful phenomenon after sunset, red streamers extending upward from the sun.

FRANCIS E. NIPHER, *Director*.

WASHINGTON UNIVERSITY, October 5, 1884.

The following is from the September report of the Louisiana Weather Service, under direction of Mr. Robert S. Day:

The temperature during the month was remarkably even and slightly higher than the average. Showers were general throughout the state between the 2d and 5th, and the 24th and 29th. Light local showers were frequent during the entire month along the coast, reaching inland about fifty miles. The rain in the northern and central portions of the state is reported as too late to help the cotton crop. The cane crop has been greatly benefited, however.

Mean temperature for September, 80°.4; highest temperature, 103°.5, Franklin, 13th; lowest temperature, 45°, Mansfield, 28th; greatest daily range, 42°, Mansfield, 27th, 28th; least daily range, 5°.1, Port Eads, 11th.

Average rainfall, 2.53 inches; greatest daily rainfall, 2.57 inches, Alexandria, 25th; greatest rainfall for month, 6.60 inches, Point-a-la-Hache; average number of rainy days, 7.

Report of the Tennessee Weather Service, September, 1884, under direction of Hon. A. J. McWhirter:

September presented no remarkable meteorological phenomena, and was devoid of any features of special interest, except the abnormally high temperature; also the small amount of rainfall, which was not sufficient to relieve the effects of the drought that began in August and continued almost uninterruptedly to the close of the month.

The mean temperature for the month was 73°.2, or 5°.7 above the September mean of last year and only 0°.4 below the mean for August. The mean of maximum temperature was 91°, or only 3° below the August mean, and that of the minimum temperatures was 51°, or 6° below the August mean. The high temperatures prevailed in the early and latter portions of the month, while the lowest temperature was general on the 19th.

The rainfall for the month was 2.07 inches, and was very unevenly distributed, the average for the eastern division being only 0.85 of an inch, while the averages for the middle and western divisions were 2.12 and 3.21 inches, respectively. The days of the greatest rainfall were the 7th, 8th, 17th, 24th, and 26th. The rain of the 17th was general throughout the state. The heaviest rainfall was confined to the northern portions of the middle division, and the northern and western portions of the western division. The greatest local daily rainfall was 1.80 inches on the 7th at Franklin, on the 8th at Manchester, and on the 27th at Dresden.

#### STATE SUMMARY.

Mean temperature, 73°.2; highest temperature, 97° on the 7th at Hurricane Switch, and on the 8th at Milan; lowest temperature, 41° on the 19th at Hurricane Switch; range of temperature, 56°; mean daily range of temperature, 18°.2; greatest daily range of temperature, 38° on the 19th at Fostoria, Kingston Springs, and Milan, and on the 21st at Hurricane Switch; least daily range of temperature, 1° on the 17th at Riddleton and Franklin, and on the 25th at Fostoria; mean monthly range of temperature, 40°.7; greatest monthly range of temperature, 56° at Hurricane Switch; least monthly range of temperature, 31° at Florence Station and Bolivar; mean of maximum temperature, 91°.4; mean of minimum temperature, 51°.

Mean depth of rainfall, 2.07 inches; mean daily rainfall, 0.069 inch; greatest rainfall, 5.91 inches at Trenton; least rainfall, 0.16 inch at Howell; greatest daily rainfall, 1.80 inches, on the 7th at Franklin, on the 8th at Manchester, and on the 27th at Dresden; days of greatest rainfall, 7th, 8th, 17th, 24th, and 26th.

Average number of days on which rain fell, 6.6; average number of clear days, 12; average number of fair days, 11; average number of cloudy days, 7; prevailing direction of wind, south.

The following summary is taken from the September report of the Illinois Meteorological Service, under direction of Mr. S. D. Fisher:

Districts.	Temperature.			Precipitation.
	Highest.	Lowest.	Mean.	
Northern division.....	91.2	47.9	68.9	4.52
Central division.....	94.1	49.8	71.3	5.55
Southern division.....	94.9	52.0	72.8	4.28
Mean for state.....	93.4	49.9	71.0	4.78

Professor W. H. Ragan, of Greencastle, Indiana, furnishes the following meteorological summary for the state, with accompanying notes:

Districts.	Temperature.			Rainfall.
	Highest.	Lowest.	Monthly mean.	
Northern counties.....	92	50	69.8	2.39
Central counties.....	98	45	69.6	4.70
Southern counties.....	96	45	71.1	6.14
State.....	98	45	70.2	4.43

NOTE.—The highest temperatures are taken from the 2 p. m. observations and the lowest are taken from the 7 a. m. observation.

The mean temperature was 6°.6 above that for the same month last year, and only 0°.7 lower than the mean for August of this year; it was about 8° above the normal in the northern counties; about 4° above in the central counties; and about 1° above in the southern counties.

Over a greater part of the state drought continued until near the end of the month, and was then relieved by copious rains.

The average rainfall for the state was about 1.50 inches above the normal, but this excess was confined to the southern and central districts, being about 3 inches in the former, and nearly 2 inches in the latter.

Professor H. A. Huston, of Lafayette, Indiana, furnishes the following meteorological summary for the state:

Districts.	Temperature.			Rainfall.
	Highest.	Lowest.	Monthly mean.	
Northern counties.....	96	43	70.4	4.67
Central counties.....	98	36	70.2	4.81
Southern counties.....	98	45	71.0	6.88
State.....	98	36	70.5	4.67

The Ohio Meteorological Bureau, under direction of Professor T. C. Mendenhall, furnishes the following summary for September, 1884:

Mean barometer for the state, 30.056 inches; highest barometer, 30.461 inches, at Wauseon on the 14th; lowest barometer, 29.369 inches, at College Hill on the 28th.

Mean relative humidity for the state, 72.2 per cent; stations reporting highest, Lebanon and Waverly, 80.8 per cent; station reporting lowest, Quaker City, 64.0 per cent.

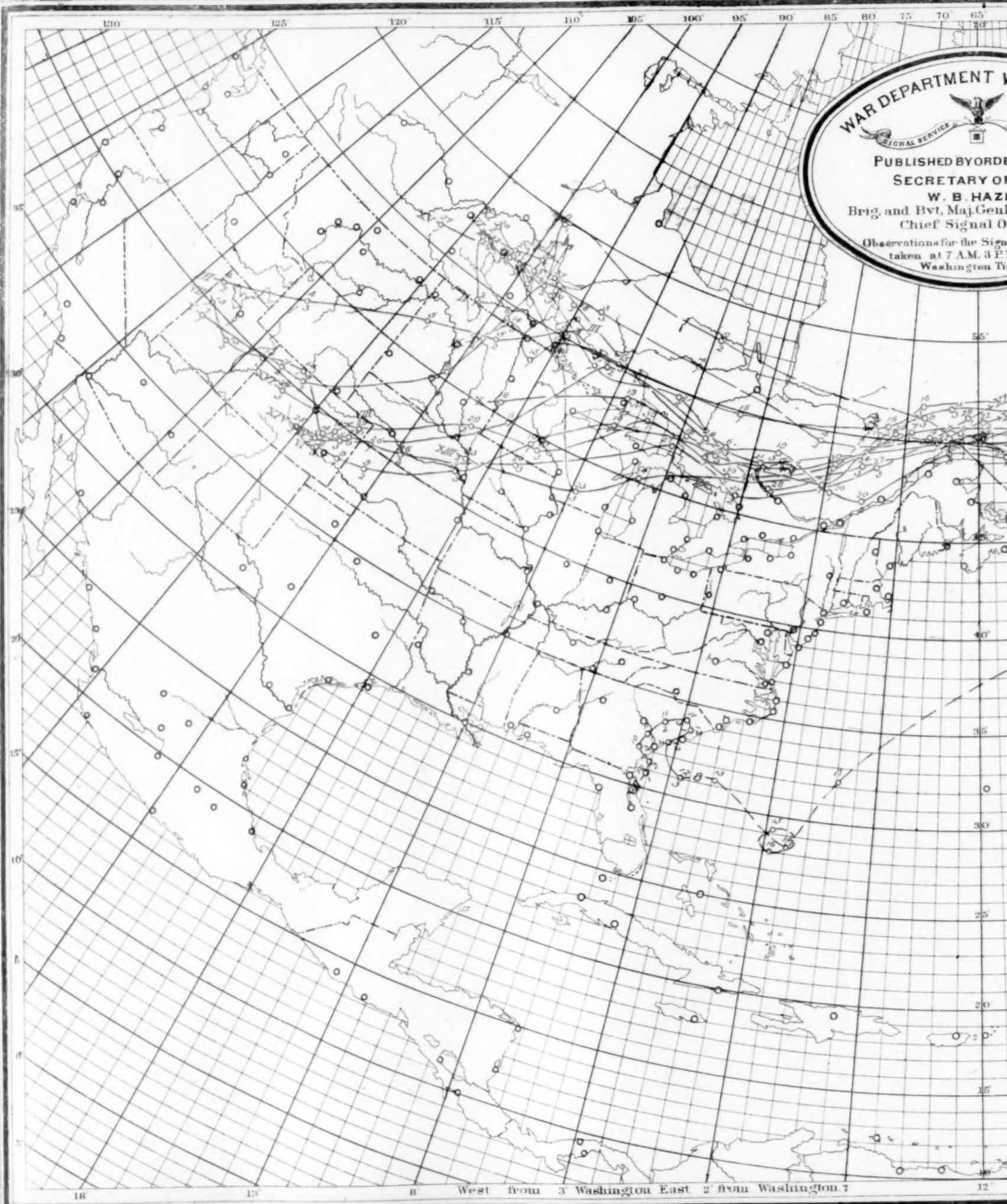
Mean temperature for the state, 69°.4; station reporting highest monthly mean, Pomeroy, 73°.9; station reporting lowest monthly mean, Levering, 64°.8; highest temperature observed, at Logan and McConnellsville, 97.5° on the 9th and 10th; lowest temperature observed at Junction, 30° on the 21st; range for the state, 67°.5; station reporting greatest daily range, College Hill, 50°, on the 5th; station reporting least daily range, Cincinnati, 5°.5, on the 29th.

Mean rainfall for the state, 3.36 inches; station reporting largest monthly rainfall, Sidney, 8.18 inches; station reporting smallest monthly rainfall, Junction, 0.68 inch.

Average number of clear days, 13.9; fair days, 10.8; cloudy days, 5.3; rainy days, 9.4.

# Chart I. Tracks of Low-Barometere

Form 106 G 1884.



**WAR DEPARTMENT**

**PUBLISHED BY ORDER**

**SECRETARY OF WAR**

**W. B. HAZEN**  
Brig. and Bvt. Maj. Genl.  
Chief Signal Officer

Observations for the Signal Service  
taken at 7 A.M. 3 P.M.  
Washington, D.C.



rometer Areas, September, 1884.

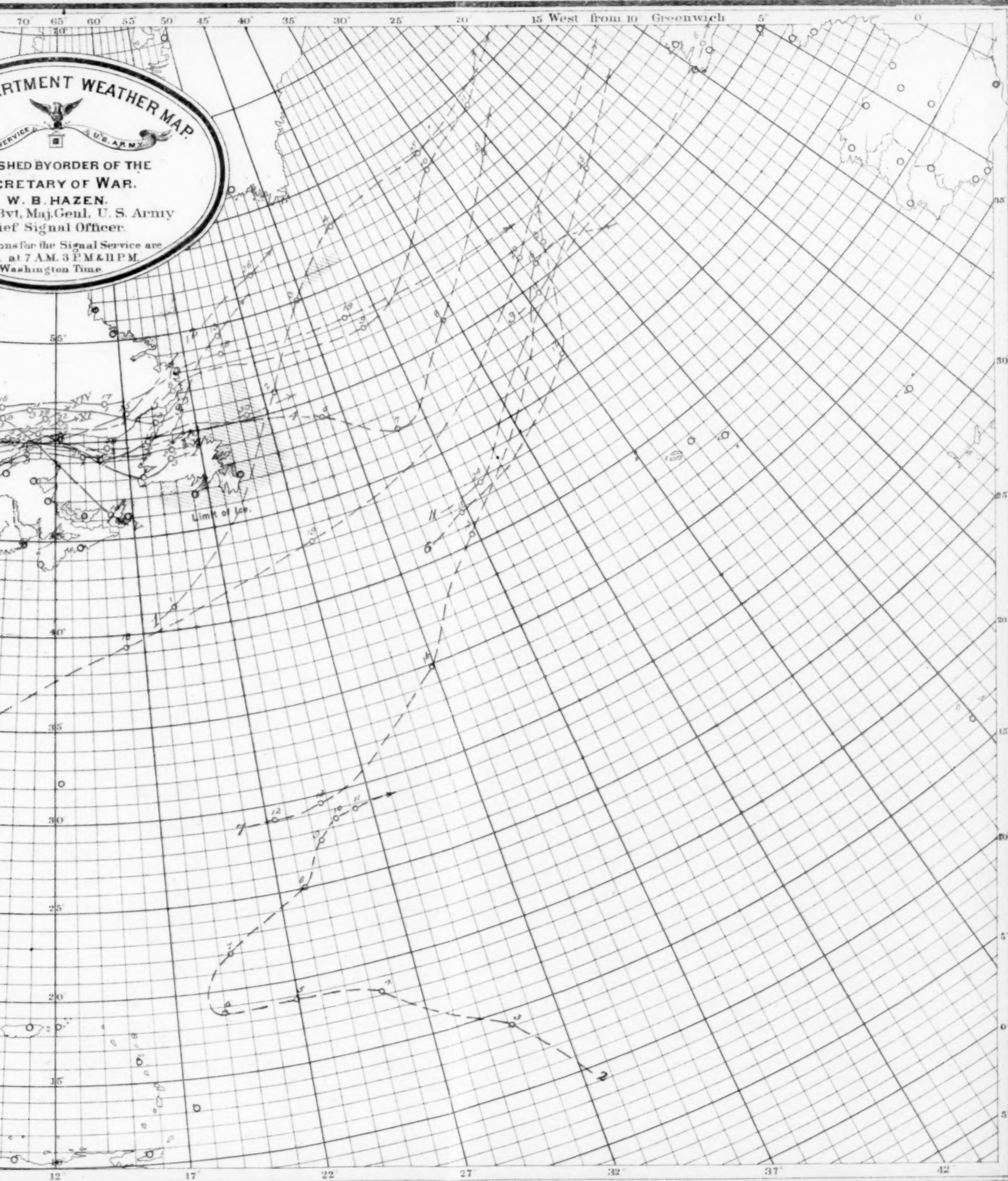






Chart II. Isotherms, Isotherms, and Winds, September, 1884.

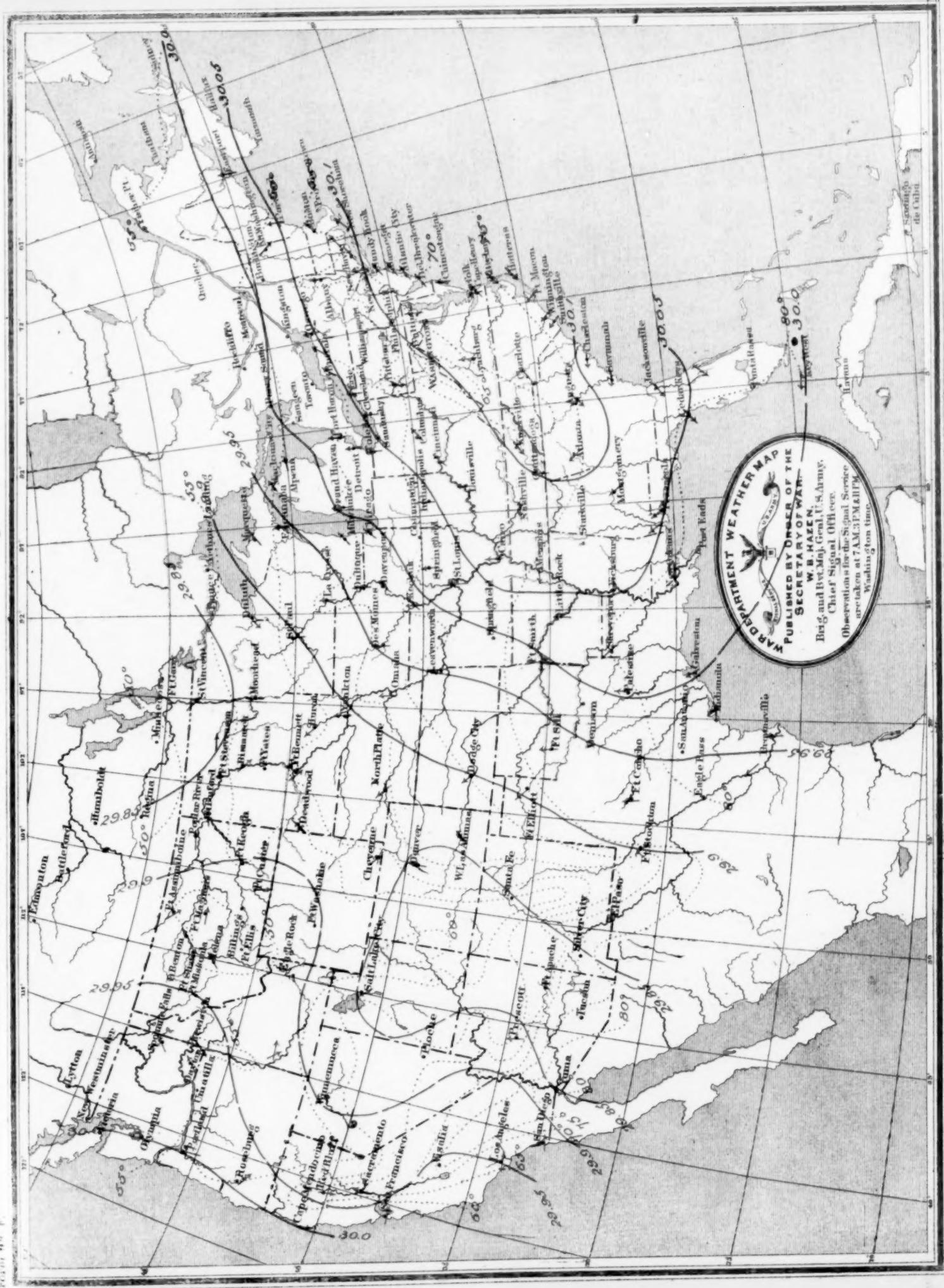






Chart III. Precipitation, September 1884.

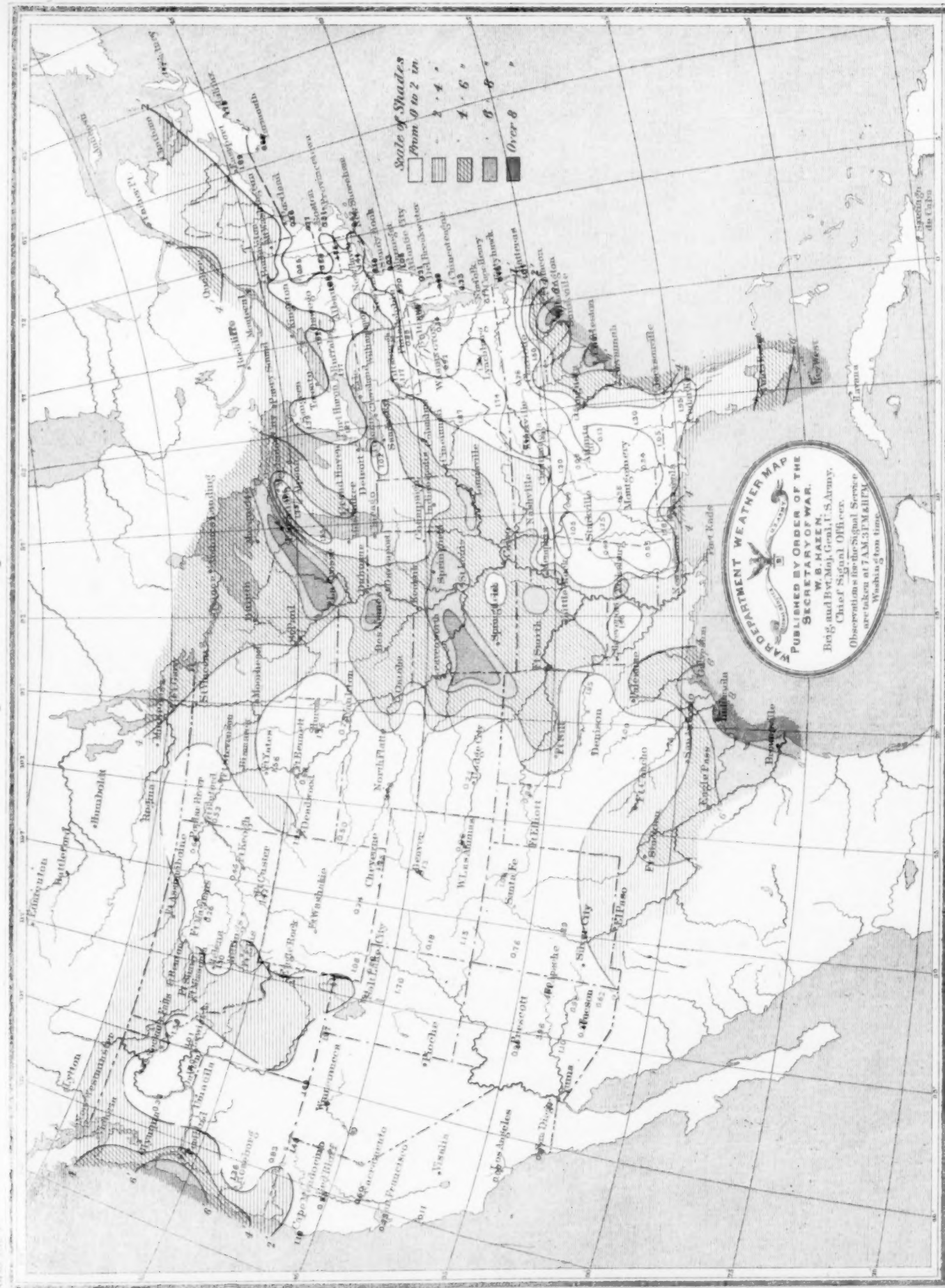
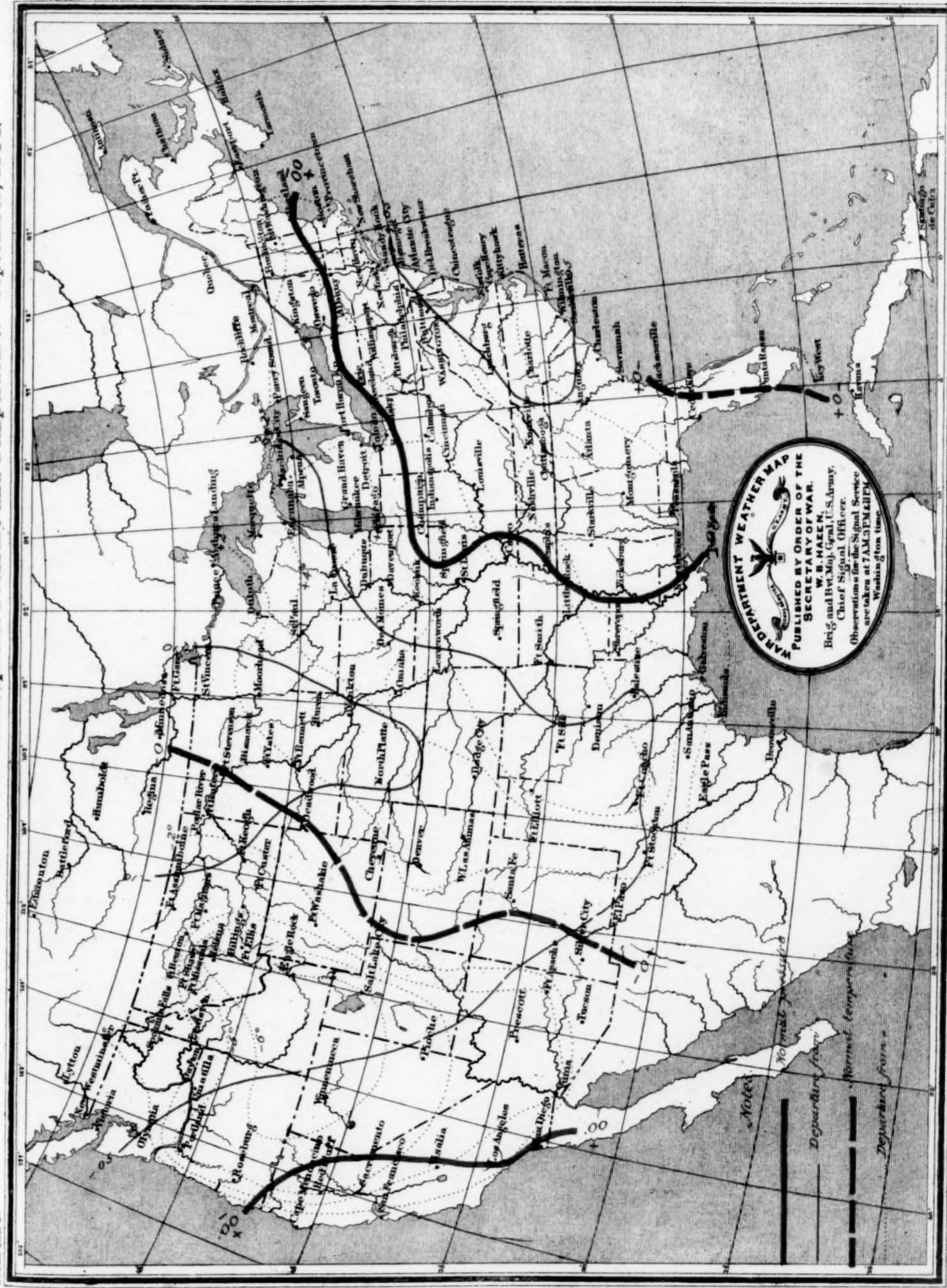






Chart IV. Departures from Normal Atmospheric Pressure and Temperature. September, 1884.



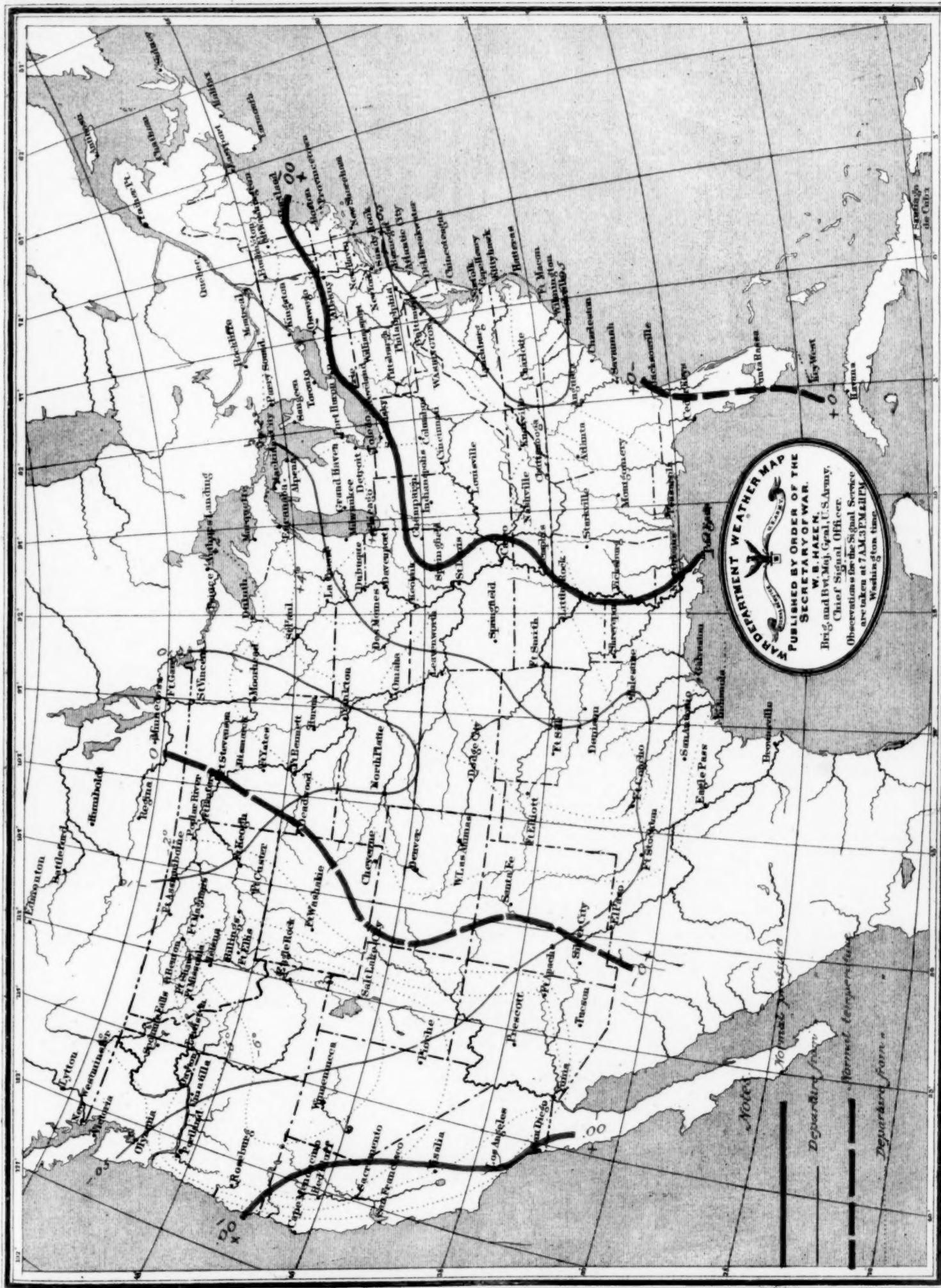
**NAVY DEPARTMENT WEATHER MAP**  
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SECRETARY OF WAR.  
W. B. HAZEN,  
Brig. and Hvy. Maj. Genl. U.S. Army,  
Chief Signal Officer.  
Observations for the Signal Service  
are taken at 7 A.M. EST. 1884.  
Washington time.





Chart IV. Departures from Normal Atmospheric Pressure and Temperature. September, 1884.

Form 106 F.



**DEPARTMENT WEATHER MAP**  
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 Weather from time